Science and Invention

AUGUST
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When Your Outboard Balks
By J. Phillips Dykes
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The Truth About Sea Serpents

Make a Collapsible Boat from Old Inner Tubes

The SCOUT Secondary Glider
By Lieut. H. A. Reynolds and Martin H. Schempp

Ideas for the Home Machinist

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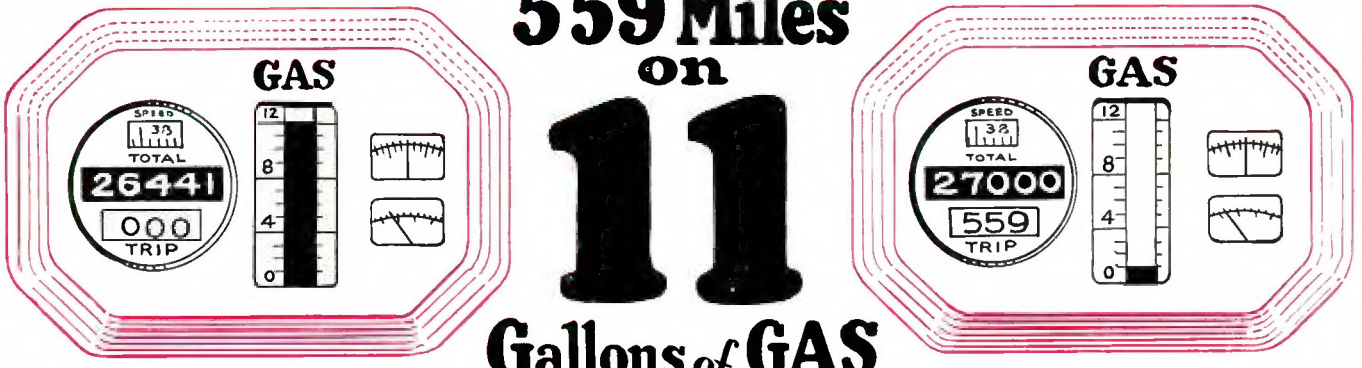
Over the Mountains from Los Angeles



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I had 15 years as traveling salesman and was making good money, but could see the opportunities in Radio. Believe me I have made more money than I ever did before. I have made more than $400 each month and it was your course that brought me this. I can't say too much for your school.

J. G. Dahlstead.
1484 So. 15th St.,
Salt Lake City, Utah

$10,000 more in Radio

I didn't know a volt from an ampere at the time I subscribed to your course. My first position was with the Garod Corp. Since then I have been in engineering work, first with the Ward Leonard Electric Company and at present with the Conner Crouse Corp. I have made $10,000 more in Radio than I would have made if I had continued at the old job.

Victor L. Osgood,
St. Cloud Ave.,
West Orange, N. J.

$700 in spare time

Although I have had little time to devote to Radio on account of illness in my family and extra time in my regular job, my spare time earnings for five months after graduation were approximately $700 on Radio sales, service and repairs. I owe that extra money to your help and interest.

Charles W. Linsey,
537 Elati St.,
Denver, Colorado

Found it all true

I had already been working with Radio since 1920. I thought that it would be useless for me to spend money for more training along the same line. From the first lesson on to the last I found out that there are hundreds of things about Radio that a person will never find out by experimenting. While I was taking the course I earned approximately $2600.

Ronald I. McDonald,
Box 23,
Sturgeon Bay, Wisconsin

My methods work—they're different

Ebert, Nichols, Winborne, Osgood, Linsey, McDonald, are only a few. Hundreds prove what I say is true

My methods do work. They are different. They do for you what I say they will do. Don't be satisfied just with my word or the word of the seven men whose letters you read on this page. Literally hundreds of men who have answered my ads have found that Certified Radio-Tricians are in demand and do make big money. Do you want a bigger salary? Some of my men double, even triple their salaries. Extra money? Many make $10, $15, $20, $25 and more in their spare time only each week. Easier work? Shorter hours? A clean job? Regular pay? Promotion? Why not?

Find out for yourself

how these hundreds of men get all this in Radio and much more with my help? There is no magic about what I do. But the results are like magic. Maybe you are in Radio already and don't get ahead. Or you may have been wanting to get into Radio for years without knowing how to get started. I have helped men in your fix before. I help you find the difficulty, then help you overcome it. That's part of my method. My Vocational and Consultation Services are based on sixteen years of personal experience helping men get ahead in Radio. I help you get off on the right foot and help you keep step with Success.

My hobby is results

I'm a practical man. What good is a system that doesn't get results? The only value to my methods is what they enable my men to accomplish. When I work with you I keep hammering on the practical side of Radio—making money at it. In order to make money you must know how to do all kinds of Radio jobs and do them all right. Take a look at the outfit illustrated directly below—notice the ship-shape, business-like job of design and construction called for in this modern Screen Grid A. C. circuit. My method gives you over 100 similar experiments covering hundreds of actual Radio problems. When you have completed these systematic experiments you have a background of experience the ordinary Radio man doesn't get in five years' "hit-or-miss" tinkering.

The man who draws the big salary, who gets $2, $3 or $4 an hour for his time instead of a fraction of that, is the man who knows the "why" as well as the "how." I give you the WHY right along with the HOW. It is what you understand thoroughly with your head and can work out expertly with your hands that puts you in the big money class. You get results with my methods because they are planned to get results for you.

Broadcasting needs trained men for jobs paying $1800 to $7000 and more yearly.

Ship Operators see the world. Get salaries of $85 to $200 a month besides.

Servicing pays big money in a spare time or full time business of your own.

Hundreds of operators will be needed for land stations and aviation Radio.

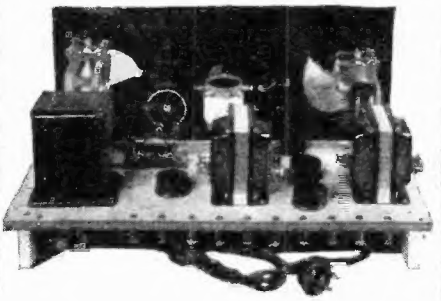
I help you get jobs

My life-time Employment Service works on this principle too. It must get results. It does get them. I don't leave you to "sink or swim." This service is free of extra cost. It not only helps you line up the first Radio job you want, but the second, the third—as long and often as you want to use it. My Employment Service helps you win promotions also. I spend thousands of dollars a year on this one service alone. I back you with all my influence and knowledge of the Radio Industry.

Maybe you'd rather be your own boss—run a paying business of your own. I show you how to get started without capital, give you detailed instructions on location, stock, turnover and profits—RESULTS. Notice my men can't get very far away from results.

Get the Cold FACTS

Whatever has been keeping you from growing right along with Radio, there is a still better reason for going ahead with Radio—for finding out what I can do for you. I have helped men of forty-five and fifty, young fellows of sixteen and eighteen. I have helped men without full grade schooling. I have helped beginners and experienced Radio men make more money, be their own bosses, get better jobs. The chances are I can help you, too. "Rich Rewards in Radio" is a FACT for hundreds of my men. Over 100 of them tell you in their own words in this book exactly what I have done for them. This book is full from cover to cover with facts about opportunities and how you can get them. It will give you the positive proof you want that my methods do work—do get results. Send for this book today.



Over $100 a week

Your course has been a Godsend to me. My earnings in Radio are many times greater than I ever anticipated when I signed up for your course. For the month of November I made $577 and for December over $645, and January, $465. My earnings seldom fall under $100 a week. I'll say the N. R. I. course is thorough and complete. You give a man more for his money than anybody else.

E. E. Winborne,
1430 W. 48th Street,
Norfolk, Virginia

$3000 a year now

I am in the Radio business here. I can safely say that I averaged $3000 a year for the past three years. Any man who really wants to advance cannot go wrong in Radio. I consider all the success I have obtained so far, due entirely to your training.

Fred A. Nichols,
1920 Seventh Ave.,
Greeley, Colorado

Employment Service puts him ahead

Before I enrolled I was making $18 a week in a shoe factory. My first Radio position as service man paid me $40 to $45 a week and the work was much easier and more interesting. After three weeks as service man I was promoted to Service Manager. Upon graduation, I passed for my first class licence and through your Employment Department, received a position with Station KWRC. Your Employment Department has again come to my aid and has placed me with the Inter-city Radio Telegraph Co.

Sylvanus Ebert,
306 S. Capital Street,
Iowa City, Iowa

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National Radio Institute, Dept. OHS.
Washington, D. C.

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Send me without obligation on my part full details about your methods and free proof that they do what you say they do.

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64 Page Book of FACTS

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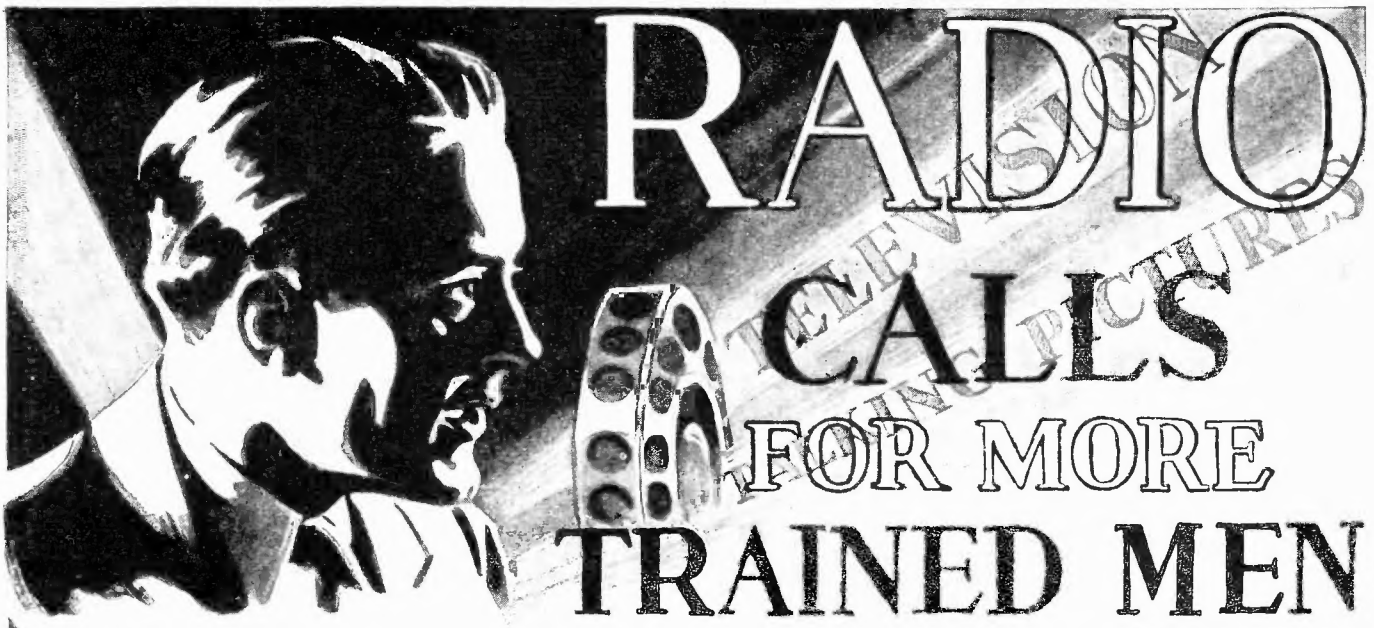

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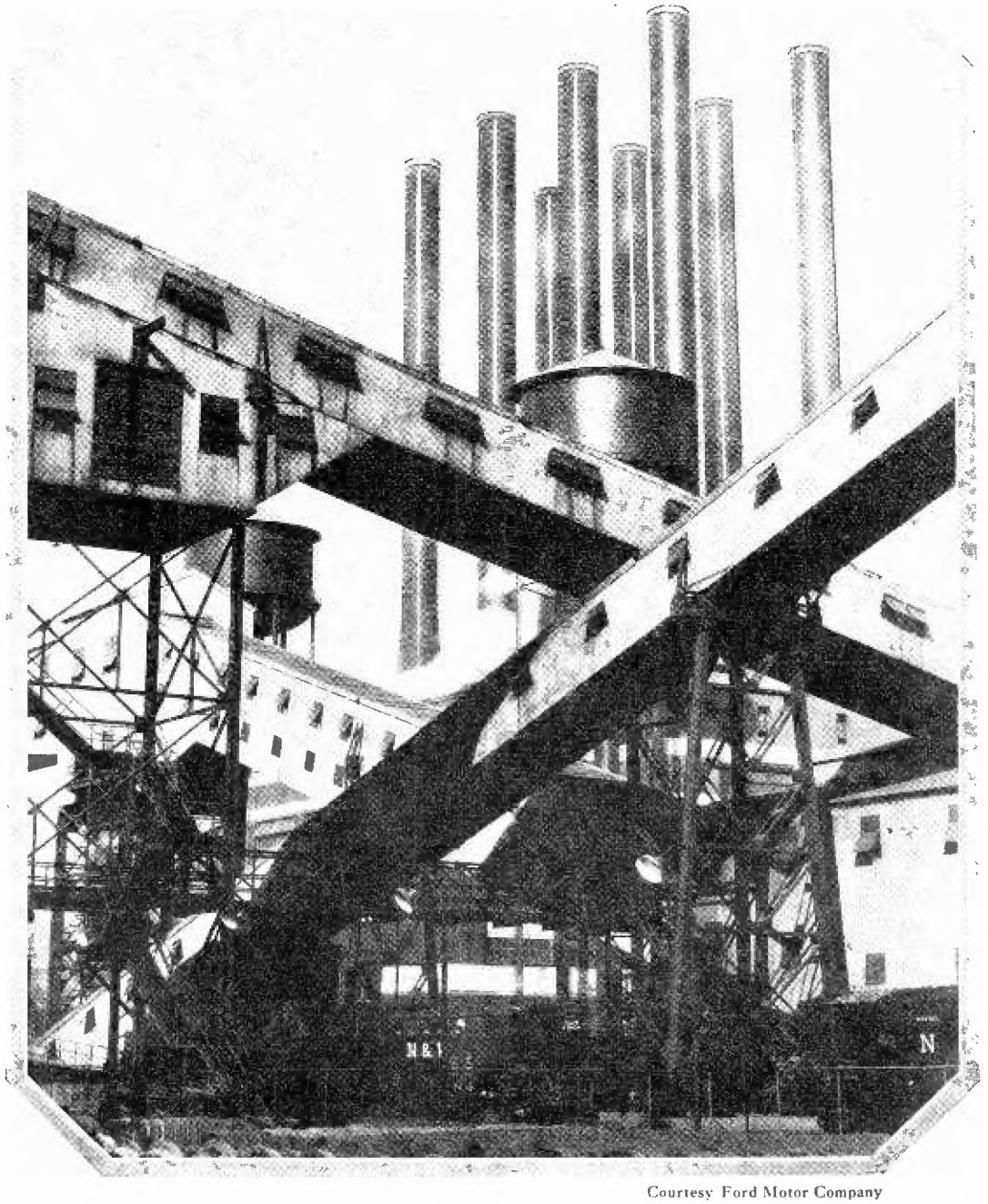
The Heart *of an* Empire



Courtesy Ford Motor Company

Here, where the planes of conveyor structures intersect each other in continuous flight, is the heart of the Ford industries. . . . Coke from the ovens arrives and flows upward to the foundry cupolas and the blast furnace high line. . . . Coal comes from the mines and is carried aloft to crushers that turn it to powder. In this form it is sprayed into the furnaces beneath the giant powerhouse stacks, and its energy is sent out to turn the wheels of machines that make motor car parts for assembly in Ford plants all over the world.

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SENSATIONAL!

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- long
- sought
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NEW Radio Discovery

- Hopkins'
- amazing
- new invention
- approved by experts

Now an exclusive feature of the

• 1931 HFL Mastertone

At last! Radio perfection is realized. After three years of intensive research work, assisted by a corps of laboratory experts, Mr. Charles L. Hopkins, noted radio scientist, has actually developed the first practical band rejecting amplifier. This miraculous new system, long the dream of radio designers, permits the construction of a remarkably efficient receiver which is ideally perfect in operation. Stations over the entire continent may now be received with an ease of tuning, unprecedented clarity of tone and total lack of interference that astonishes engineers and fans alike.

• Interfering Stations Rejected

Application of the Hopkins principle to the 1931 HFL Mastertone has immediately resulted in three outstanding improvements. Now, for the first time in radio history, it is possible to tune in an exact 10 kilocycle channel to the complete exclusion of everything else on the air. Not 9 or 11 or 16 kilocycles, but 10—with mathematical accuracy. Stations on each side of the selected band are sharply cut off and *actually rejected*. This heretofore unattainable action now takes place over the entire tuning range. The set does not "go broad" even on the highest wave lengths.

• Tonal Perfection Realized

The salient feature of the Hopkins band rejector system is that it handles all musical frequencies with an absolutely even intensity. No sacrifice in selectivity is made in order to obtain these marvelously realistic tonal reproductions. Although the 1931 HFL Mastertone maintains a precise 10 kilocycle signal channel at all times, every note and each delicate overtone *right up to 5000 cycles* comes through with a life-like quality that is a revelation. Far distant stations have the same superb tones due to the complete elimination of all local interference.

• 12,500 Mile Reception

Engineers the country over proclaim the 1931 HFL Mastertone to be the greatest long distance receiver ever designed. Its range is easily 12,500 miles (world-wide reception) whenever weather conditions permit such distances to be covered. Five 224 screen grid, two 227, two 245 and one 280 tubes are employed. A tremendous reserve power of *over 400 per cent* is available. The Mastertone is unconditionally guaranteed to receive any station on earth that can be heard with a radio set.

• Ultra Modern

In addition to the Hopkins RF amplifying system the 1931 HFL Mastertone incorporates every modern improvement known to science. One dial, one spot, 180 K.C. intermediate amplifier. Resistance coupled, push-pull phonograph amplifier, controlled from panel. Puncture proof, high voltage, humless Electrofarad filter condensers. Self contained, all steel heavily cadmium plated chassis. Doubly shielded radio frequency circuits and dozens of other entirely new features. Our FREE literature gives complete information and prices. *Send for it today!*

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AUGUST, 1930
NUMBER 4

Science and Invention

VOLUME XVIII
WHOLE NO. 208

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The Airport Problem

A FRIEND OF OURS—a magazine editor—was in a large mid-western city on special business. In hot pursuit of the object of his trip, he found that it would be of great advantage to him to have a personal conference with a newspaper man, a close friend of his, in a city about 200 miles distant.

The trouble was that a railroad journey to the point in question would have consumed time he could ill afford to spare. Not that the railway service was poor. On the contrary it was very good. Nevertheless, train schedules were such that in one way or another more than an entire day would be taken up with this supplementary trip, provided he made it by rail.

In this emergency the editor was reminded that an air line had been in regular operation between the two cities for several months. He checked the flying schedule and found to his delight that he could go to his destination, hold his conference, and fly back the same day. Moreover, he could sleep fairly late in the morning and return early enough in the evening to accomplish something beyond the actual trip.

At least, that was how it looked in prospect. Actually it did not work out this way. The editor found that he had to tumble out of bed, gulp a hurried breakfast, and be on his toes to catch a bus for the airport an hour before plane time. At the other end of the line it was worse; the airport was located so far from the city that he required nearly two hours to reach his friend's office, though he took a taxicab for the purpose. Landing, after the return trip, he ran head-on into the middle of the twilight traffic and reached his hotel long after the dinner hour, thoroughly exhausted. He was glad to turn in without any further attempt at business that day.

Figuring it out next morning, the editor found that the time of travel between airports and destinations was actually greater than the flying time, though the distances concerned were far less than that covered by the airline.

This incident illustrates one major obstacle met by the airplane when it tries to compete over short-distance routes with other transportation forms. The advantage of the swifter means of travel is more than counteracted by the excessively slow transport at either end of the line. This holds true in all but a very few American cities. It is a problem that must be solved before air transport can become a familiar established fact in the lives of ordinary folks.

One way of solving it might be to locate small airports close to the center of population in the cities, and connect them by aero taxi service with the main airports, which would be much larger and situated some distance from the business and industrial area. Thus the disadvantage of slow transportation to and from the air terminals would be eliminated, while the advantages of airports of large size outside the urban district would be preserved.

There is no doubt that large airports preferably should be located in the open country. Urban areas contain structures which are a constant source of trouble and danger to ships as they land and take off, and on muggy days the smoke from industrial plants is added to the fogs that nature places in the way of those who fly.

On the other hand it is certain that the advantages of the suburban airport must be supported by the urban airport, built perhaps as a platform above several blocks of buildings—a method proved feasible in view of what has been accomplished in launching and landing planes on the decks of ships—and connected by a flexible aero taxi or bus service with the main air terminal.

Arthur H. Lynch

"Those Who Refuse to Go Beyond Fact Rarely Get as Far as Fact" - - - - HUXLEY

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Pledge to the Public on Used Car Sales

1 Every used car is conspicuously marked with its lowest price in plain figures, and that price, just as the price of our new cars, is rigidly maintained.

2 All Studebaker automobiles which are sold as CERTIFIED CARS have been properly reconditioned, and carry a 30-day guarantee for replacement of defective parts and free service on adjustments.

3 Every purchaser of a used car may drive it for five days, and then, if not satisfied for any reason, turn it back and apply the money paid as a credit on the purchase of any other car in stock—new or used. (It is assumed that the car has not been damaged in the meantime.)

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Give this car five days to sell itself!

"And if it fails to sell itself?"

"Bring it back! Every used car backed by the famous Studebaker Pledge carries the privilege of five days' driving trial"

YOU have five days to test the used car you buy under the terms of the famous Studebaker Pledge. Furthermore, if the car does not *sell itself,* you may return it within five days and apply your payment on *any* car in your Studebaker dealer's stock, new or used.

Under the terms of this famous Pledge, you get good appearance, good performance, and good value because most Pledge-backed cars have been thoroughly reconditioned. Certified cars sold under the Studebaker Pledge carry a 30-day guarantee. And every used car carries its lowest price marked in plain figures.

To get the full protection of the Studebaker Pledge, see your Studebaker dealer *first* when you buy a used car—get this assurance of complete satisfaction!

STUDEBAKER

Builder of Champions

Invest 2c . . . you may save $200!

Spend 2c now for your copy of this interesting and instructive booklet, "How to Judge a Used Car"—it may save you as much as $200 on the used car you buy. Mail the coupon now!

THE STUDEBAKER CORPORATION OF AMERICA
Div. 178, South Bend, Indiana

Please send me copy of "How to Judge a Used Car."

Name.....

Street.....

City..... *State*.....

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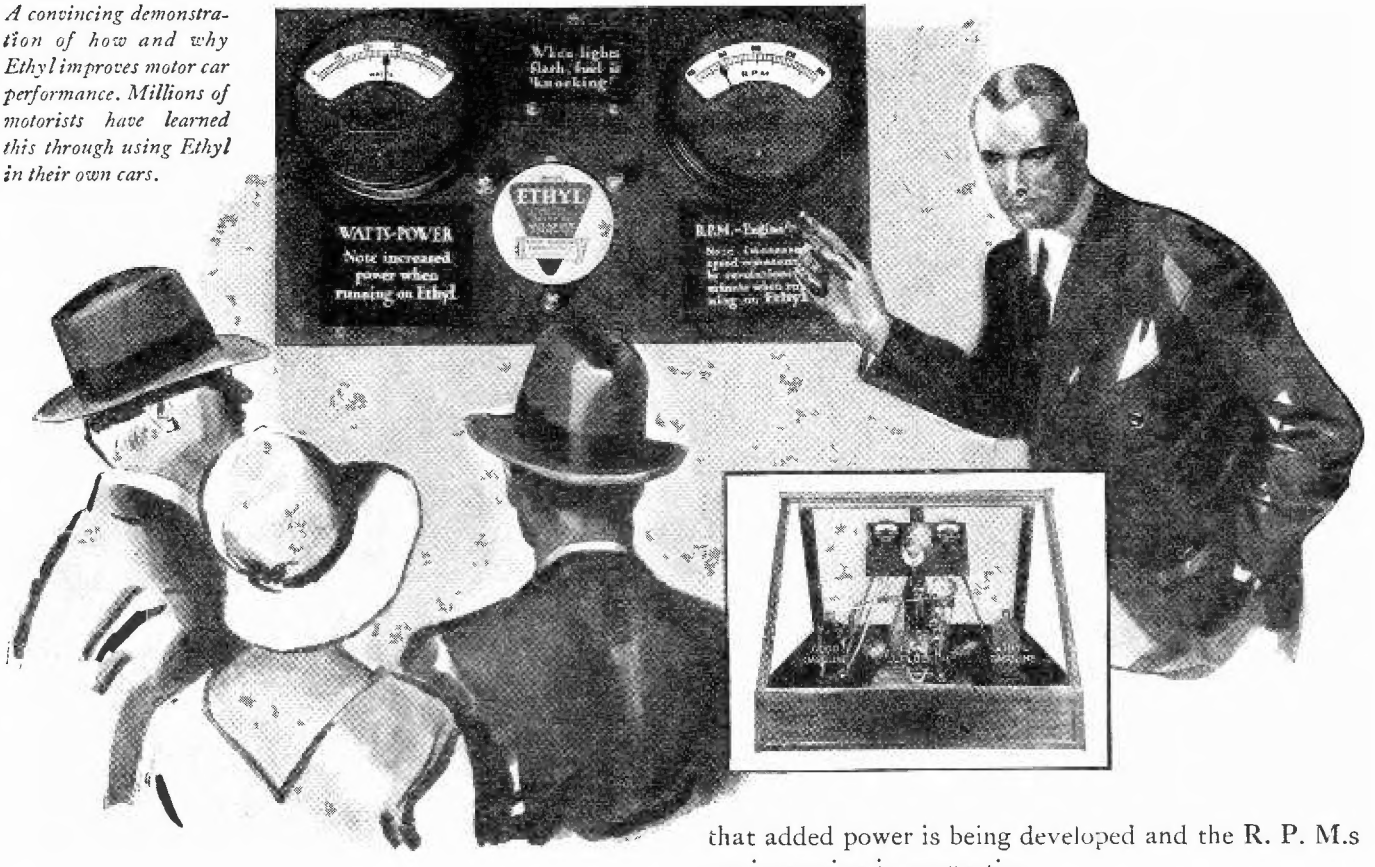
You can *see* Ethyl "*knock out that 'knock'*"

A convincing demonstration of how and why Ethyl improves motor car performance. Millions of motorists have learned this through using Ethyl in their own cars.



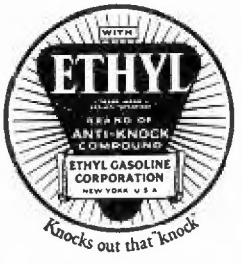
THIS "knock" demonstration machine, which is shown at state and county fairs and other public gatherings throughout the country, enables you to *see* Ethyl "knock out that 'knock'."

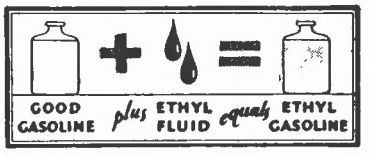
This is made possible by the Midgley Bouncing Pin—a device attached to the demonstration engine which causes a group of lamps on the instrument board to flash every time the "knock" occurs. A wattmeter registers the power being developed and a tachometer shows the R. P. M.s (revolutions per minute) at which the engine is turning over.

In these demonstrations, the engine is run first on ordinary fuel. It "knocks," the lamps flash, you note the position of the needles of the wattmeter and tachometer. Then the valve controlling the fuel is turned and Ethyl replaces the ordinary fuel. The "knock" becomes fainter and dies, the flashes become dimmer and disappear, the engine runs smoothly, quietly. At the same time you *see* that added power is being developed and the R. P. M.s are increasing in proportion.

In terms of your own car this means improved performance through greater power and flexibility, quicker pick-up, less vibration, easier handling and slower depreciation.

Ethyl Gasoline is good gasoline to which leading oil companies are adding Ethyl fluid, the anti-knock compound developed by automotive research to improve motor car performance. Try Ethyl in your car. You will see and feel the difference It is on sale everywhere at pumps bearing the Ethyl emblem shown below.





Wherever you drive—whatever the oil company's name or brand associated with it—*any* pump bearing the Ethyl emblem represents quality gasoline of high anti-knock rating.

The active ingredient used in Ethyl fluid is lead.

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ETHYL GASOLINE

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SCIENCE *and* INVENTION

Volume XVIII. Number 4

AUGUST 1930

"Hocus Pocus!" Cried the Ancient Medicos

By Carl Holliday

Professor of English, State College, San Jose, Calif.

Likewise They Clouted the Sick Cow and Gave Lunatics the "Smoke Cure," Sang to Their Suffering Patients and Invoked the Angels Against Aches and Pains

IF YOU had a most painful attack of rheumatism and your physician suddenly entered your sick-room and shouted, "*Hocus Pocus, tonus talonteus, vade celeriter jubeo!* You are cured!" —how long would it take you —in spite of your rheumatic pangs—to disappear from that vicinity? Yet there was a time a few centuries ago when doctors in remote or rural sections of England and Europe used just such "doctor's Latin" for not only rheumatism but for many another disease.

To this hour the street fakir uses those opening words, "Hocus Pocus." That expression in the old-time physician's prescription simply illustrates how slowly both Christianity and science were absorbed by our Anglo-Saxon pagan forefathers. For "*hocus pocus*" is but the misunderstood phrase of the priest to his early English congregation — "*Hoc est corpus*"—"this is the body," and the hideous Latin used by the doctor of that day was merely his command, in the name of the body of Christ, for the disease to depart speedily.

Ancient rites and superstitions die hard. For instance, Virginia and Tennessee mountaineers to this day maintain that an iron ring on the third finger of the left hand drives away rheumatism. It is an old, old faith—this ring-finger business. The ancient Egyptians believed that a nerve led straight from that finger to the heart.

When an ancient medic set out to visit a plague victim, he disguised himself like a cross between an ant-eater and a King Kleagle. One imagines few germs could withstand the sight. This effigy of an old plague doctor was shown at a recent hygienic exposition in England.

The Greeks and Romans taught that a blood vessel called the "vein of love" connected the two. Fourteenth century alchemists stirred their dangerous compounds with this finger because it could most quickly indicate by a feeling in the heart the presence of poison. Moreover, the ancients maintained that when the ring finger became numb death was at hand. Thus in twentieth century America is found a superstition ancient when the pyramids were building.

Mysterious words were a vast help to Anglo-Saxon doctors in curing their patients. The less the sick understood the words the more effective the cure—a sort of suggestive therapy! For instance, the titles of foreign gods and idols brought fear to English demons in a sick man's body. Therefore, when Christianity first entered the British Isles and was but dimly comprehended, physicians found that the names of saints, apostles, and Greek and Latin forms for the word "God" were rough on germs, bacteria, and pains in general! Often a polyglot cure was effected by means of a jumbling of several languages, and this device did especially fine work if given by the doctor in rhythmic lines. As an example this bit of poetry, composed of five languages, was "sure-fire" for twelfth century gout:

Meu, treu, mor, phor,
Teux, za, zor,
Phe, lou, chri,
Ge, ze, on.

Similarly, mysterious figures or letters were deadly enemies of any ailment that afflicted a man a thousand

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Our sturdy forefathers didn't fool with sick cows or confirmed rumdums. They socked and smoked them until the spirits who caused the distemper sought another home.

Brook water was a specific for old age—if you drank it right; and by making contact between a bird and a sore spot you might transfer the disability.

Illustrations by Leo Morey

years ago. Along with the introduction of Christianity among our English ancestors came the Greek letters "*Alpha*" and "*Omega*," and in his curative powwows your old-time physician made victorious use of the two strangers. Then, too, what a help were paternosters, snatches of ancient Latin hymns, bits of early Church ritual—how their newness and mystery did assist! And could not geometric figures discovered in a handful of sand and seed foretell the outcome of the disease—and do not we of this day still tell our fortunes in the figures revealed in the dregs of our tea-cups?

Those doctors of long ago were a determined set. Desperate remedies were in vogue—not at all homeopathic, you may be sure. All diseases were caused by demons—the diabolic ancestors of our modern germs—and the practitioner of Anglo-Saxon days did not hesitate to use subtle flattery or dire threatenings to chase the little devils from the human body. When a cow became ill, your earlier veterinarian yelled, "Fever, depart; 917,000 angels will pursue you!" And if that cow stubbornly continued to enjoy ill health, a hole was pierced through her left ear, and her back was struck with a club to force the monsters to flee through the puncture. Much the same methods were tried upon suffering mortals; for your husky doctor of twelve or fifteen hundred years ago attempted to cure insanity—on the basis that seafood is good for the nerve—by lambasting the lunatic with a porpoise-skin! And if this failed to bring sanity the crazy fellow was thrust into a closed room and *smoked* until free of the tormenting demons. This procedure might be tried in these days of murderers who excuse themselves on the grounds of insanity or "brain storm."

Profound faith those early Europeans had in violent words or deeds as a cure-all for disease. Teutonic tribesmen relieved sprains by reciting boastfully how Baldur's horse had been cured by Woden after all the other celestials in Valhalla had failed, and certainly long after the entrance of Christianity the Germans and Anglo-Saxons hung about their necks images of Thor's hammer—as a gentle reminder to any disease germs that might be lurking about. From Asia into Europe had come the dreadful boast of the doctor: "The great mill-stone that is India's is the bruiser of every worm. With it I mash together the worms as grain with a millstone!"

Certainly it would have been useless on the part of the Christian missionaries to attempt to cast out such ancient and deep-seated beliefs at once, and the clergymen merely substituted the names of Christ, the Virgin Mary, and the saints whenever they found opportunity. As late as the middle of the nineteenth century one might hear in Cornwall such a charm as this for tooth-ache:

Christ passed by his brother's door,
Saw his brother lying on the floor;
What aileth thee, brother?
Pain in the teeth.
Thy teeth shall pain thee no more,
In the name of the Father, Son, and Holy Ghost, I command the pain to be gone!

Many a modern physician would have starved to death in those old days; for *singing* was an absolute essential in your old-time doctor's practice. Sometimes he chanted into the patient's left ear, sometimes into his mouth, and sometimes to some particular finger. The hideous concerts probably induced many a sick man to get well immediately. As an aid during the musical performance the practitioner frequently placed a cross upon some section of the victim's anatomy, or crosses upon the four corners of the house or the harness of the sick man's horse or even upon the footprint of the man or of some beast that he owned. Often, too, by the way, an image of the female generative organ was drawn upon the door—an idea handed down from the sex worship ideas of the early Greeks and Corinthians, and this image had sovereign power in influencing the course of disease. And to this day do we not seek good luck by placing the same symbol over the door—in the form of a horseshoe?

The methods of healing were almost as marvelous in those times—and as cock-sure — as those for rejuvenation in our own era. To cure the stomach ache, catch

(*Continued on page* 355)

Sometimes our ancestors fed their ailments to the dog, pushed them through a hole in a tree, or put them into raw meat and buried them.

Leathering a lunatic with a porpoise skin was a favorite method of treatment. You could tell which party was crazy by noting which was shackled down. The horseshoe was a general preventative.

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Sea Serpents, Thinks a Famous Deep Sea Expert, Are Not Delusions, But Illusions . . . Presented by Giant Squids—Fearful and Dangerous Relatives of the Great Octopus

The Truth *about* Sea Serpents

By Alma Chesnut

WHEN globe-trotting friends, returning from Europe with the end of summer, seek to regale you with reports of sea serpents on the way over, do not be too caustic in your comments about wet ocean liners. The ocean enfolds many fabulous creatures, says Dr. Paul Bartsch, deep sea expert of the National Museum, in Washington, and who can deny with finality that such a monster exists?

Science has no authentic record of a sea serpent; that is, none has been captured, measured and preserved in a museum, but scarcely a summer goes by when one is not reported from some vessel or seaside resort. Masquerading under many names—kraken, kraxen, krabben, korven, ankertrold, soe-horven, soe ormen, horven aale-tust—it has been celebrated in literature and folk lore from immemorial times.

"Sea serpents," says Dr. Bartsch, "have undoubtedly decreased in size and number since the Prohibition Amendment and Volstead Act went into effect, but I would not care to assert definitely that there is no such creature.

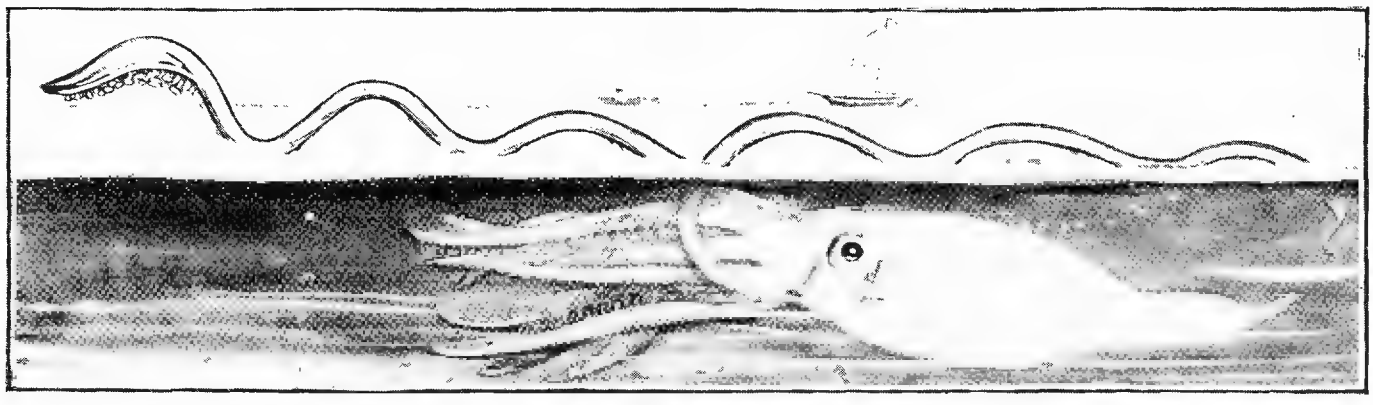
"The ocean is virtually unexplored territory, but we know that it supports many forms of life that are almost unbelievably fantastic. I have seen many strange sights during my voyages

The giant squid has been known to attack fishing boats.

of exploration, which have taken me to Europe, Asia, the Tortugas, the Philippines, the Bahamas, Curaçao, and many other ports. Few would believe that a jelly fish could kill a man, yet in the Philippine Islands a boy dived into a gigantic specimen and was dragged out of the water dead. This is only one instance.

"There are several plausible explanations of these perennial sea serpent yarns. I myself once thought I saw a kraken. It was in 1909 and I was cruising in a little vessel at the southern tip of the Philippines, just off the coast of Borneo. We had come to a place where coral reefs had formed a quiet harbor and the sea was deadly calm. My companion, the Commissioner of Fisheries for the islands, was looking out across the water when suddenly his face went white with excitement. I followed his gaze and, I suppose, turned pale myself at what I saw.

"A series of shining loops, that reflected the bright tropical sun, appeared undulating over the surface of the water like a great snake. We quickly maneuvered the vessel toward this awesome spectacle, but when we examined it with glasses at closer range we found that the effect had been created by a school of porpoises, leaping along, one after the other as if playing follow-the-leader. An unscientific person might not have (*Continued on page* 360)



Manipulating its arms, the squid may present the appearance of a sea serpent above the surface.

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Searching *for the* Essence *of* Madness

By James Nevin Miller

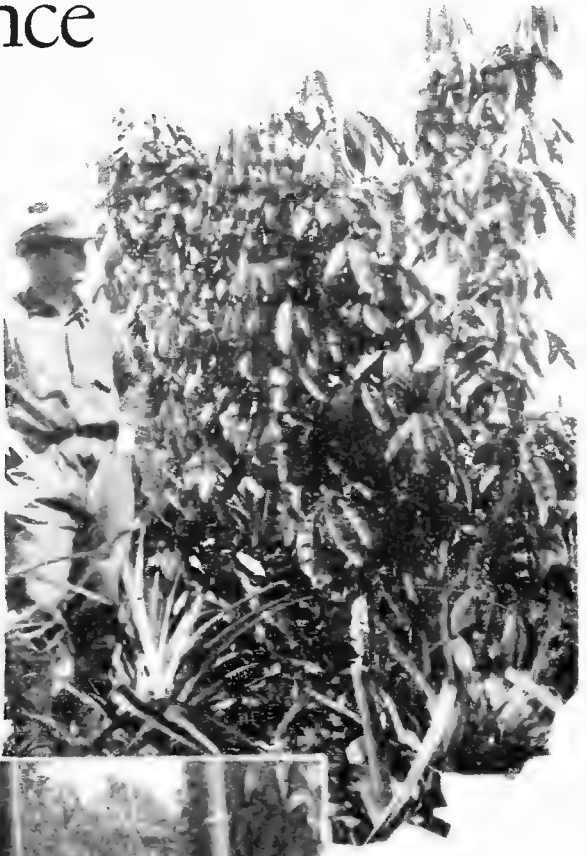
In the Depths of a South American Jungle a Smithsonian Expedition Found Plants That Bring Dreams, Coma, Death

A THRILLING eight months' search in the South American jungles for the strangest drug in the world has been ended with success by Ellsworth P. Killip, eminent Smithsonian botanist.

For some years scientists had been hearing fantastic tales of the effects of a drug called by the natives "fury poison," derived from the stem of the rare *ayahuasco* plant. One story declared: "It is bitter and difficult to take and its reactions on the human system are weird, to say the very least. A death-like pallor is produced on the face of the drinker, a pallor supplemented by spasmodic contortions of the facial muscles, that leads the observer to believe the addict must be suffering the torments of the damned while seeing all the dread paraphernalia of Hell.

"This stage of the trance is followed by a protracted period of fury—arm-thrashing and destruction of property—any movable material the addict can lay his hands upon. Next comes a stage of quieter hallucinations such as are commonly supposed to result from the use of laudanum. Before the eyes of the drinker of *ayahuasco* passes a panorama of the world, including visions of unspeakable joy and beauty. Floating like a cloud over the earth's surface, the victim looks down upon charming valleys, wooded hills, silver lakes and bubbling streams. He sees ornate palaces, colorful flower gardens, and mystic mirages; and sometimes pleasant human beings, and at other times devils and demons of the underworld."

Intent upon securing plant specimens for the Smithsonian Institution, Dr. Killip and his companions—Dr. Albert C. Smith of the New York Botanic Gardens and Prof. William J. Dennis of the University of Iowa—left New York City eight months ago for their South American expedition. It carried them over some 12,000 miles of land and sea, 6,500 of which were through the jungles, icy mountain ranges and uplands of Peru and Brazil.



Here's the real prize of the South American expedition — the mysterious "fury poison" plant yields a strange drug which is said to drive the drinker through torments into sweet dreams.

In addition to specimens of the strange *ayahuasco* plant, the travelers brought back to America sections of the plant from which the natives concoct barbasco—a root poison used to kill fish in streams. The natives cast this poison into streams where it has a visible and potent effect upon the finny population. Badly stunned, the fish may be caught by the nimble fingers of the native divers. Though the (*Continued on page* 361)

The 9,200 different kinds of plant specimens were dried over kerosene stoves in special bags.

Two native Indians of the South American wilds.

Transportation of the party varied from airplanes in the more civilized regions to native llamas, such as these used in the primitive life at Porgora, east of Huanta, Peru.

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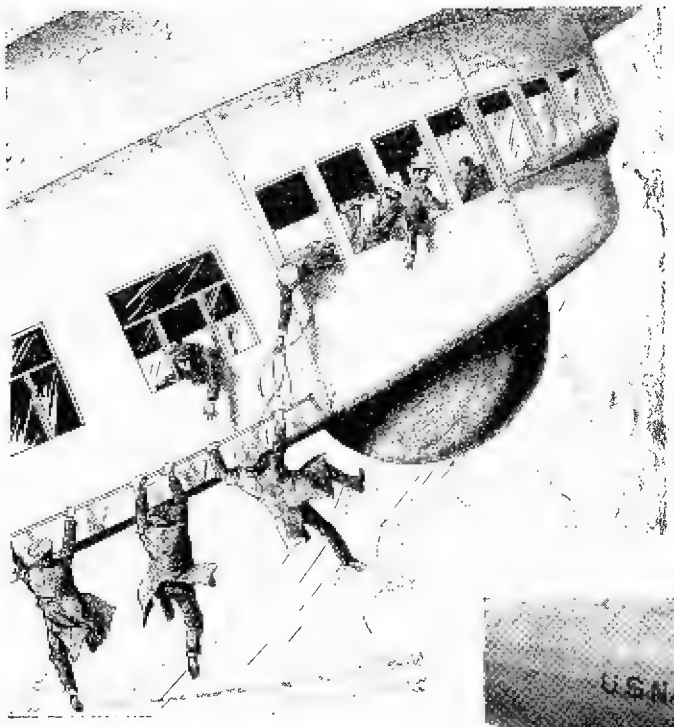
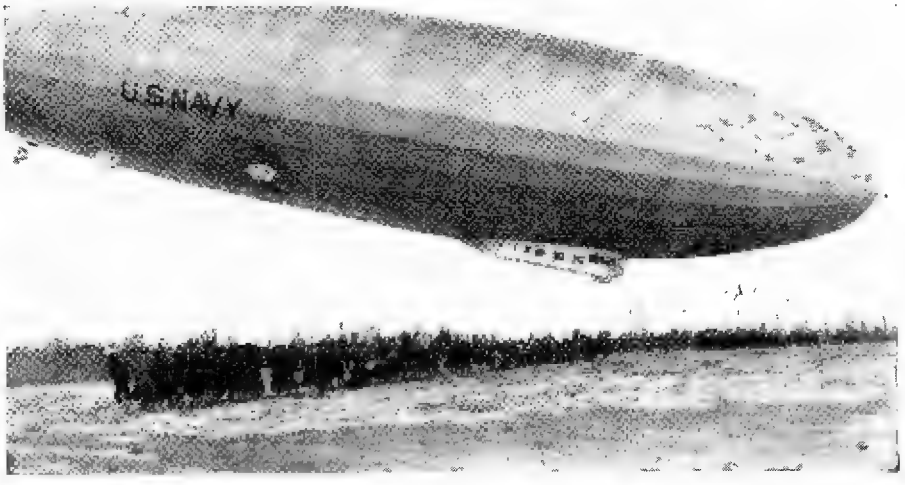


The Sky Navy's Playful Porpoise

By William Watts Chaplin

Former Staff Reporter with the Associated Press



"It was like some freakish nightmare," the author says of the incident shown in the drawing, when the Los Angeles leaped from the ground with five members of the mooring crew clinging to the handrails along the cabin. The photograph shows the Los Angeles being walked to a new position.

THE navy dirigible Los Angeles is one of the finest flying laboratories in the world. It is an enormously valuable labor-saver. It is a superb training ship. But all ships are feminine in gender, and the Los Angeles, just like its sisters of the sea, must every once in a spell give way to a temperamental tantrum.

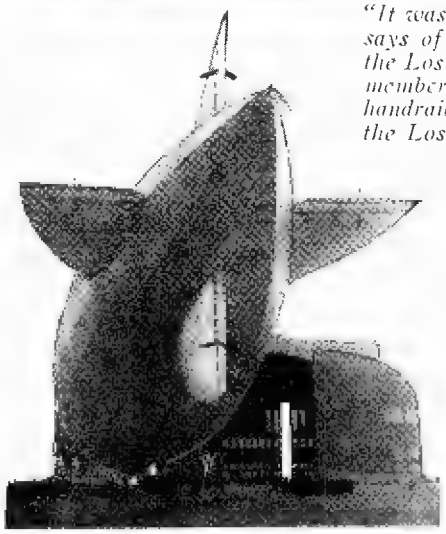
I have ridden the Los Angeles when it answered the helm as sweetly as a yacht. Then again I have seen it kick over the traces like an army mule.

My first introduction to the great rigid ship was not so long after the other big navy dirigible, the Shenandoah, had met disaster in the Middle West. It was about to undertake the important work of calibrating the coastal radio stations between Lakehurst, N. J., and Richmond, Va., and I obtained permission of the Navy Department at Washington to go along.

Persistent cross-winds which created an area of atmospheric turbulence about the ends of the hangar kept the silvered sky-scooter land-bound for several days and I had ample opportunity to study the work being done at Lakehurst and to talk with the captain of the ship, Commander Charles Rosendahl, in whose mind even then were dreams of airships far larger than the gigantic pair now under construction at Akron.

He imparted much of his faith in the value of lighter-than-air ships, explained the experimental work constantly being carried on with the dirigible on land and in the air, and spoke of his visions of the ships of the future. Later he showed me how this old lady of the skies could buckle down and do in a few hours a job for which a steamer would need days or weeks.

Commander Rosendahl has been especially interested in improved mooring facilities, mechanical means for replacing the large ground crews, and in a new movable stub mast that runs on rails. Much has been accomplished along these lines. The Los Angeles was also the laboratory for testing out a water recovery system which takes the moisture from the engine exhaust and puts it in ballast tanks to counteract the lightening effect of fuel consumption. These were brought to such a high degree of efficiency that it is not unusual for the Los Angeles to return from a flight heavier than when it started out. The water recovery machines not only take moisture from the exhausts, but they also do a bit of dry cleaning on the air the ship passes through. *(Continued on page 381)*



Above—The Los Angeles being walked to its hangar. Left—The navy dirigible silhouetted against the clouds.

This Is the Fourth of a Series of Dramatic Close-Ups by William Watts Chaplin. The Third—Aloft with the Bouncing Blimps—Was Published in July. The Fifth—The Missing Member of the Crash Board—Will Appear in the September Number.

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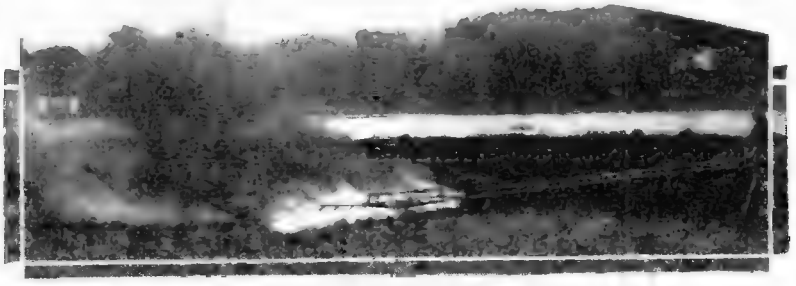
Insects Attack—Man Counter-Attacks

THIS newest aerial weapon for use against the insect armies which threaten man has a capacity of 700 pounds of insecticide powder and distributes its load at 115 miles an hour. It incorporates a special venturitube crop duster, a geared feeding arrangement in the hopper where the powder is carried and a dust-proof cabin in which the pilot is safe from the effects of the poison he spreads.

THE flame thrower, one of the atrocious pieces of armament brought forth by the Great War, has been taken up enthusiastically by the men who defend the nation's crops against insect marauders. In the two pictures that border this caption the Hell Fire Boys are engaged in the difficult job of cooking the corn borer, a potent European invader. Reports from the corn sector indicate the enemy is a glutton for punishment and intends to stick it out.



IN California it has been found necessary to establish permanent munitions plants to furnish ammunition for the battle against the hordes of insects that threaten the state's finest crops. The munitions worker below is collecting lady beetles at a Los Angeles insectary, where these hungry little marauders are raised to fight the mealy bug, an insect which perennially assaults the citrus crop in the Sunset State. . . . When the beetles reach the belligerent age they are packed in capsules — ten in a capsule—and sent out to farmers at the rate of a half cent each.

IN the section of the insectary shown above potatoes are raised to feed mealy bugs. Then the mealy bugs are turned loose among the lady beetles. After feeding up on mealy bugs for a while, the lady beetles begin to prefer them to any other delicacy. Once this point is reached, the lady bugs are ready to be shipped to the field of action.

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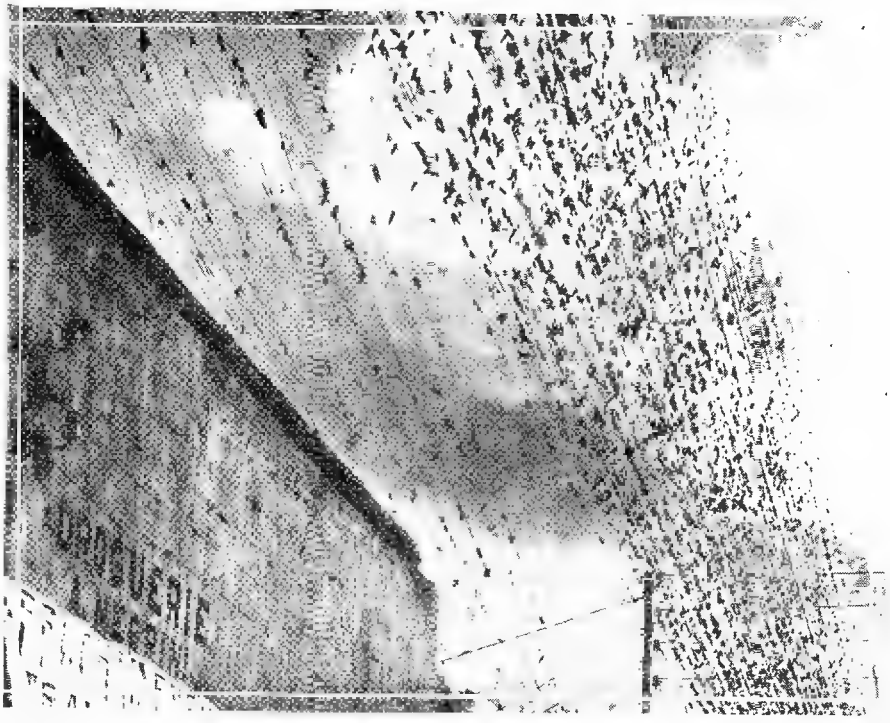
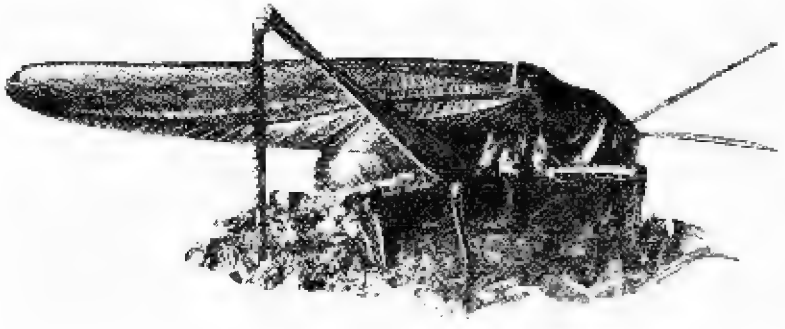


IN the July number of SCIENCE AND INVENTION appeared an article on the warfare of insects and men. . . . In this picture spread we amplify from a news angle the idea of the never-ending strife which seems destined to go on for the control of the world. . . . Glance at these pictures and see for yourself whether the war is not a fact.

Planes and Flame Throwers Are Two Weapons Used by Men in the Everlasting War Against the Insects Which Destroy Our Crops and Goods . . . And from the Communiques Arriving from the Front Lines You Can See That Our Most Deadly Assaults Are Not Too Effective

THIS Arab doesn't seem disturbed by the locusts which, in their journey across Asia and North Africa, have reached him. Perhaps he has a certain sympathy with them, for according to report he is probably something of a marauder himself.

THAT cracking sound heard by bus passengers in Moroccan cities is not due to the action of hot pavements on tires. It's just part of this year's locust army that didn't bother to get out of the right of way. Locusts are like that. They seem to feel that there are too many of them to be blotted out by any means whatever and that one locust is just as good as the next. At the top of the page is a close-up of telephone wires in Marakesh, Morocco, where some of the locusts have happened to park.



AT the lower left a mama locust is pictured planting her own crop and what a crop! With her daggerlike ovipositor, plainly visible in the picture, she is thrusting an egg sack—containing from 10,000 to 18,000 eggs!—into the earth. . . . In two weeks the recruits will join the locust army and in three weeks they will be ready to supply more troops. Which helps to explain why a locust, when death threatens, is apt to act just as though he didn't give a cold, smooth clam. . . . At the immediate left is the ovipositor, by which the seeds of destruction are sown.

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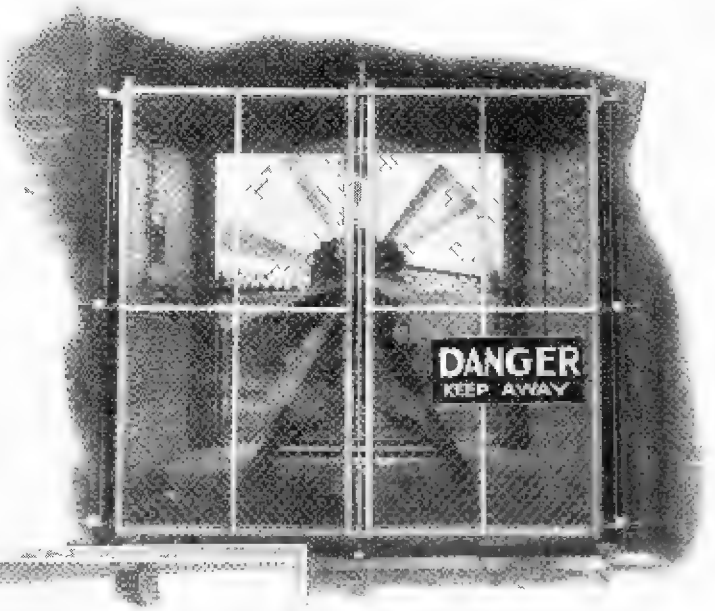
Caged Motors

By Clarence M. Young
Assistant Secretary of Commerce for Aeronautics

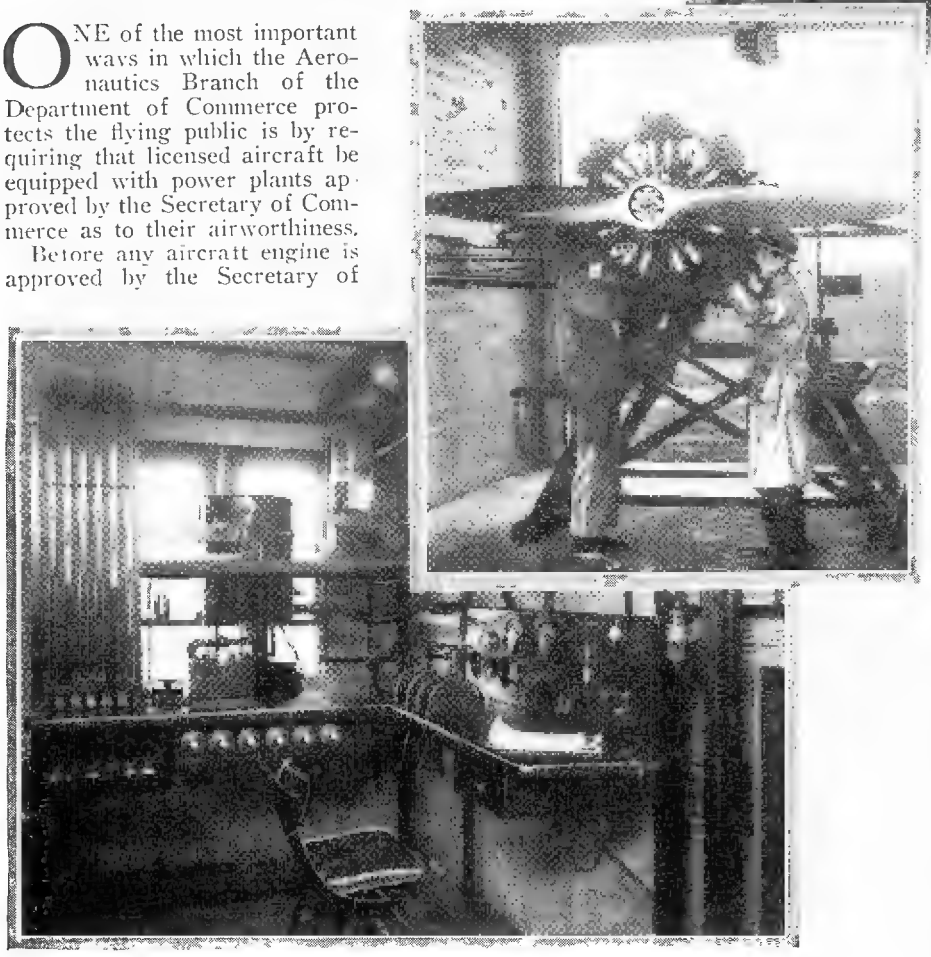
In Cells Barred with Steel-Webbed Doors, Uncle Sam Tests New Aero Engines to the Limit Before Approving Them for Actual Flying Use



At the left, employees are preparing a radial aero engine for a run on one of the three torque stands. Above a torque stand test is in progress behind the steel cage doors of a testing compartment.

ONE of the most important ways in which the Aeronautics Branch of the Department of Commerce protects the flying public is by requiring that licensed aircraft be equipped with power plants approved by the Secretary of Commerce as to their airworthiness.

Before any aircraft engine is approved by the Secretary of Commerce, it must be type-tested. To conduct type tests, the Aeronautics Branch, through the engine-testing section of the Bureau of Standards, recently completed a new testing laboratory at Arlington Farms, near Hoover Field, Va., a few minutes' journey from Washington. This plant now comprises three separate testing units, each of which has a torque stand on which the engine is mounted and an observing room which houses the instruments and the testing staff. A fourth unit is to be installed immediately. A shop room, equipped for disassembly and inspection of engines after test, and for minor servicing during test, is also provided.



The observing room at the Department of Commerce laboratory is equipped to record complete operating data on the engines tested.

The plant includes a furnace room providing central heating for the entire unit, an office and a record room, and a separate concrete building for the storage of gasoline and oil, designed for protection from fire and explosion hazards.

With the three present torque stands in daily operation, the plant is capable of turning out at least one complete engine type test per week. By the use of the additional torque stand, the employment of additional personnel, and the operation of all four units on a double-shift basis, the capacity will soon be increased to 100 type tests per year. Each new type of aircraft engine, unless it has been tested by the Army or Navy, must pass a special test conducted by Department of Commerce engineers. The imperative necessity for this test is indicated by the fact that there are over sixteen more or less distinct aircraft engine classifications in the country, as against about four automotive. Automobile engines in regular use today are limited almost entirely to the Six-in-line, the Four-in-line, and the "V-type" and Straight eight. Aircraft engines, on the other hand, include the Two-cylinder opposed, the Three-cylinder radial, the Four-in-line, the Four-in-line inverted, the Six-in-line, the Six-in-line inverted, the Five-cylinder radial, the Six-cylinder radial with two-throw crankshaft, the Seven-cylinder radial, the Eight-V, the Eight-horizontal or opposed, the Nine-radial, the Twelve-V, the Twelve-V inverted, the Twelve-W, the Eighteen-W, and the 24-cylinder X. With a few exceptions, which are experimental types, all these aircraft engines are now commercially available.

According to the aircraft engine requirements of the Department of Commerce, a fifty-hour endurance test must be run in ten five-hour periods. During the first five hours the engine shall be run with the throttle wide open, the speed being at least equal to the rated speed specified by the manufacturer. The power rating of the engine is based on the average horsepower developed during this period. During the remaining nine periods, the engine shall be run at approximately 97 per cent of the rated speed, and the horsepower developed should at no time be less than (*Continued on page* 357)

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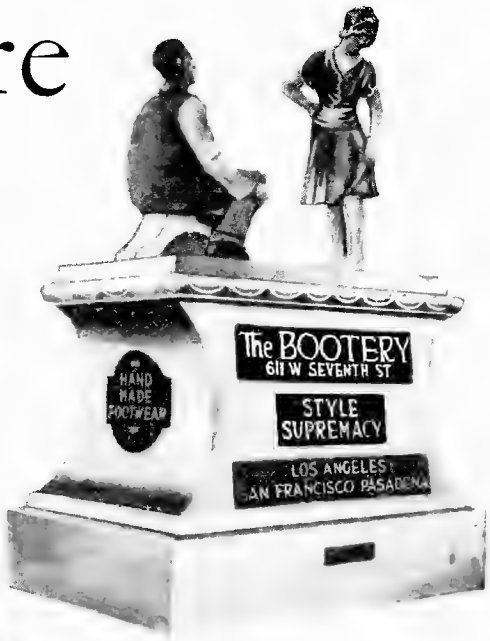
Sculpture Bats for the Billboard

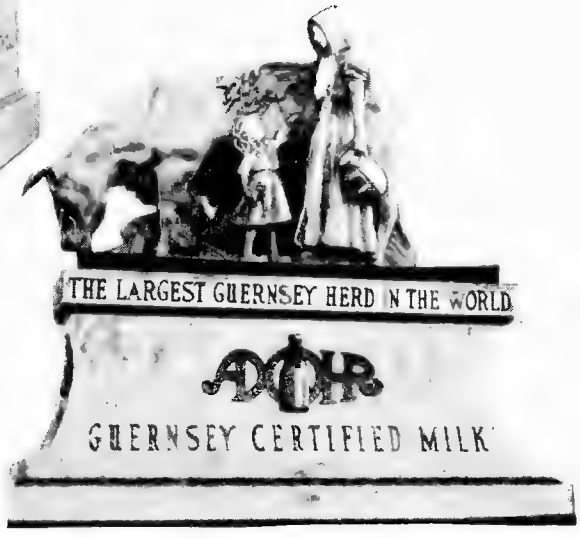
Once the age-old apothecary's symbol, the pestle-and-mortar, stood forth on every drugstore worthy of the name, telling the world that within might be had herbs, roots, minerals and their extracts and essences, in combinations good for man or beast. . . . These days, the enterprising pharmacy on the Pacific Coast erects a commanding sculptural group beside the highway to inform the modern motoring man where to go for his bottled sunlight, his favorite serum, and his hay-fever vaccine. The statuary above shows the St. George of Medicine slaying the Dragon of Disease.



Shoe repairmen once inevitably made use of the boot as a symbol of their trade, and so did those who made or sold shoes to the populace. Many of the old boot signs still survive, despite the fact that the only boots most of us know are rubber ones. Dressed up and electrified as it is, the boot symbol at the left can't hold a candle to the sculptured group above, which informs the passing world of the location of a leading West-Coast "bootery." It is certainly a pleasure to think that America is finding use for its sculptors in modern outdoor advertising. There was a time when some doleful folks regarded the sculptor as permanently wedded to the lawn-ornament, porch-urn, and tombstone foundry.

Ancient and honorable are the locksmith's symbols pictured below and employed by a hardware dealer to stress his lock-and-key trade.

Given the bathing costumes of a few years ago, a sculptured representation of a beach club group would be no great shakes from any but Mrs. Grundy's point of view. . . . Happily, no such historical obstacles stand in the way of sea beach sculpture today. That's what makes the group on the left such a wow.



THE Pacific Coast has gone in for sculptured outdoor advertising and is certainly making progress. . . . The beauty of the sculptured signs is that they are, many of them, good to look at, and often add a decorative rather than a jarring note to nature's scenes. . . . In each case an original work is reproduced as many times as is necessary by the casting process, thus bringing the new medium within the reach of practically all reasonably prosperous advertisers.

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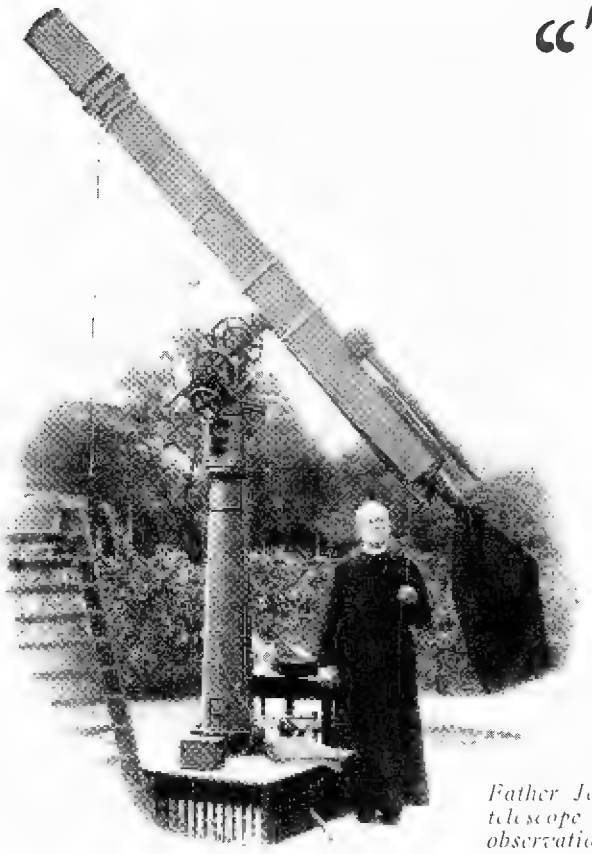
"The Padre of the Rains"

By Captain John R. Irwin
Air Corps Reserve

For Almost Fifty Years Father Ricard Has Forecast the Weather for the People of Pacific Coast . . . His Famous Sunspot Theory Enabled Him to Issue Weather Bulletins for a Month in Advance . . . Eventually His Observatory May Issue Forecasts Covering Entire Seasons



Father Jerome S. Ricard, and the telescope he used in making the observations that led to his Sunspot Theory.

TWILIGHT has fallen upon the labors of California's "Padre of the Rains," the affectionate title by which Father Jerome S. Ricard is known to several generations of westerners. To the scientific world he is better known as the priestly scientist who first advanced the "Sunspot Theory." At the advanced age of 81, about a year younger than the university where he has labored for half a century, Father Ricard, because of continued ill-health, has been compelled to retire from all work connected with Santa Clara University and the observatory erected in his honor.

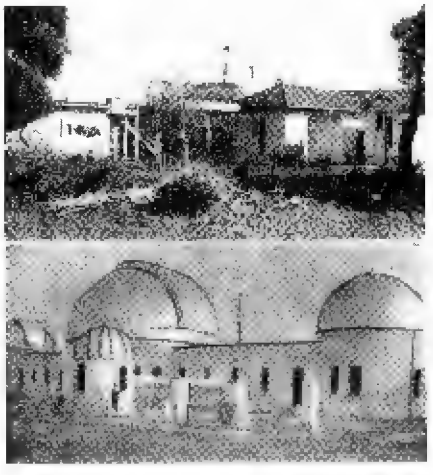
The "Padre of the Rains" has become an institution upon the Pacific Coast. While citizens living in other sections of the United States have had to be content with retail methods of ordinary weather forecasters, those living in the states bordering the Pacific have been receiving wholesale weather reports. For Father Ricard for the past thirty years has been issuing bulletins, not merely a day ahead, but a whole month, and his predictions have been accurate, too.

Santa Clara University was founded some eighty years ago and occupies the grounds around the old Spanish Santa Clara Mission which had existed since 1777. Father Jerome Sixtus Ricard was born in the little town of Palisson, France, in 1850. After being ordained a priest in the Jesuit Order, he came to Santa Clara in the early 'eighties and taught there until his retirement recently after celebrating his Golden Jubilee of fifty years in the priesthood.

In addition to his duties as a teacher Father Ricard carried out much research in astronomy. He commenced this scientific work in a small shack in the gardens of the campus, using whatever instruments came to hand. Outsiders assisted in furnishing equipment for the studies of the kindly, cheery Padre, and it eventually included seismographs for recording earth tremors. As the years progressed Father Ricard startled the scientific world by advancing the theory that the appearance and disappearance of spots noticeable upon the sun's surface coincided with certain disturbances on the earth. His advocacy of the "Sunspot Theory" resulted in much controversy; but when he demonstrated its accuracy by correctly forecasting the weather for a month at a time, the theory was given wide acceptance.

Recently, at a gathering in his honor, Father Ricard attempted to explain to his laymen listeners what he humorously termed his "secrets."

"Sunspots," he said, "are produced by planets in line with the sun. Sunspots in transit make the highs and the lows—and the highs and the lows make the weather. Foreknowledge of critical planetary (*Continued on page 377*)



The old observatory on the grounds of Santa Clara University, from which weather predictions were issued for a month ahead for thirty years, was originally a small shack. The New Ricard Memorial Observatory below it is the gift from tens of thousands of Father Ricard's friends.

In addition to his duties as a teacher and his work as an astronomer, Father Ricard found time to devote himself to gardening in the old Mission grounds at Santa Clara, where the first padres worked.

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What to Do When Your Outboard Balks

J. PHILLIPS DYKES was born in Atlanta in May, 1898. He was educated, but not tamed, at Georgia Military Academy, New York Military Academy, and the University of Georgia, and enlisted in the U. S. M. C. for the World War.

As Topographer and Aerial Observer, he served with the First and Second Divisions and in the Army of Occupation. After his discharge he made —and lost— a fortune in the Florida real estate boom. Just now he is best known as the builder, owner, and designer of many champion speed boats, including the famous Miss St. Petersburg, 151-cubic-inch Mississippi Valley Champion. As a participant in races he has won 49 out of a possible 55 events in all classes, acquiring two world's championships in the process. At Trenton, N. J., July 4, 1929, he won four races out of a total of five, defeating a field of eight 120-horsepower runabouts and 151 class hydroplanes with a Fairchild hull driven by a Johnson 32-h. p. motor.

In October of the same year he was elected Rear-Commodore and Secretary of the American Outboard Association . . . Meanwhile he has written many articles on boats and also a book on Florida fishing.

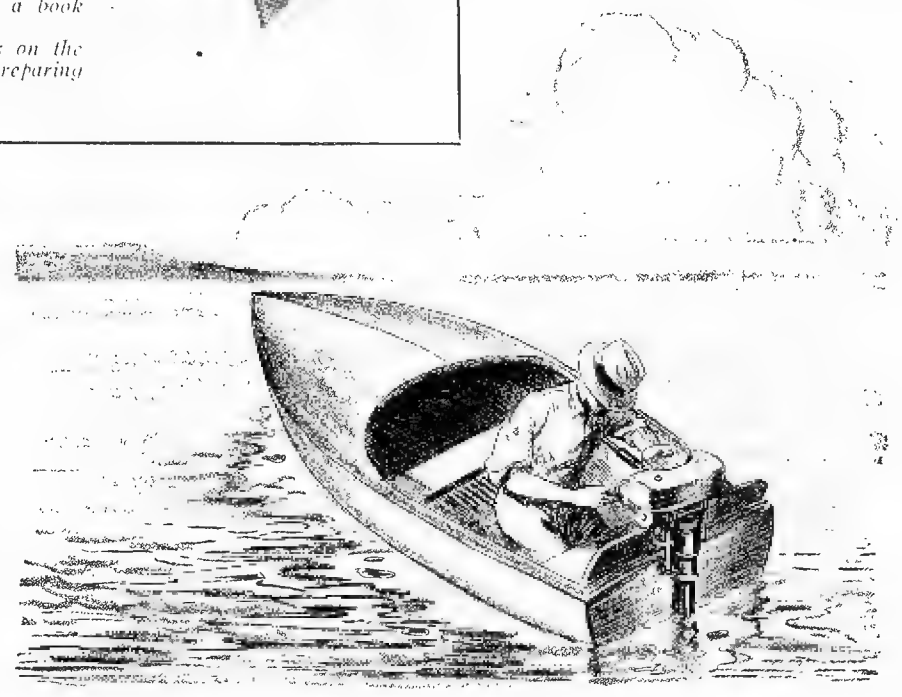
This is the first of a series of articles on the technique of outboarding which he is preparing especially for SCIENCE AND INVENTION.

By

J. Phillips Dykes

Rear-Commodore and Secretary American Outboard Association

Get Wise to the Common Causes of Won't-Go-itis in Your Outboard Motor, and Save Cuss-Words, Time, and Money by Shooting Trouble Yourself



VACATION time! Thousands of outboard motor enthusiasts bound for their favorite fishing hole, lake or seashore resort carrying just a few of the 85,000 outboards sold last year and probably half of that number delivered so far since January 1, 1930.

Several of these chaps will no doubt run into a snag sooner or later, when, for reasons known to the wise, that usually dependable little chunk of machinery simply will not respond.

Bear in mind the following whenever you have trouble with your motor. Fully ninety percent of all outboard motor ailments are due to four causes: Ignorance, Carelessness, Improper Mixing of Fuel and Lubricants, and—last but not least—Accidents Due to Striking Obstructions in the Water.

Since we are shooting trouble this month, let's begin at the beginning, where our first taste of trouble usually occurs—the starting of a cold two-cycle motor.

Our fuel and lubricant are mixed together, and we must remember, when starting a cold engine of this type, that there is a greasy coating of congealed oil all over the inside of our cylinders, on the pistons and in the combustion or mixing chamber. This coating completely seals the cylinders and of course makes the motor turn hard, thus giving a weak spark on the start, a poor mixture due to excess oil, and a subsequent flooding of the motor if the condition is not remedied as soon as firing takes place.

Turn on the gasoline petcock. Open the needle valve a turn more than directions specify. Flood the carburetor. Now take your starting rope and rock the motor back and forth against compression at least twenty times. This will cause the congealed oil to be softened by the fresh gasoline and will fill all cylinders with a heavy charge of vaporized gas and oil. Now give the starting rope a hard pull, advance the spark with the first explosions, cut down the needle valve to normal, and you will have accomplished a perfect start under any condition of wet or cold, while the other chap watches you speed off with envious stare!

If you have occasion to stop the motor don't forget to shut off the gasoline as soon as your motor stops. It will do away with flooding, and in restarting it will be necessary only to rock the motor ten or fifteen times before applying the rope.

Fuels if properly mixed according to the directions on the gas tank of your motor can be entirely controlled by the air supply and needle valve. Of course, dirty or waterlogged gas will cause trouble, but ordinary precautions such as straining through a chamois will eliminate this source of trouble.

Sometimes, however, a hot motor will not start even though the driver thinks he has taken all usual precautions. Here is a sure way to start a balky motor when it is hot and probably flooded. Disconnect (*Continued on page* 359)

ARTICLES of this type can cover only in a general way a subject that in many cases calls for detailed treatment. If Mr. Dykes can help you solve any problem regarding hulls, motors, parts, fuels, racing rules, the formation of clubs, or the managing of regattas, let him know. He'll be glad to give you all the information at his command. Write on one side of the paper and enclose a stamped envelope for his reply.

Be brief and specific. Questions likely to interest many outboarders will be answered in these columns. Otherwise your problem will be treated in a personal letter from Mr. Dykes or from some other authority on the subject involved.

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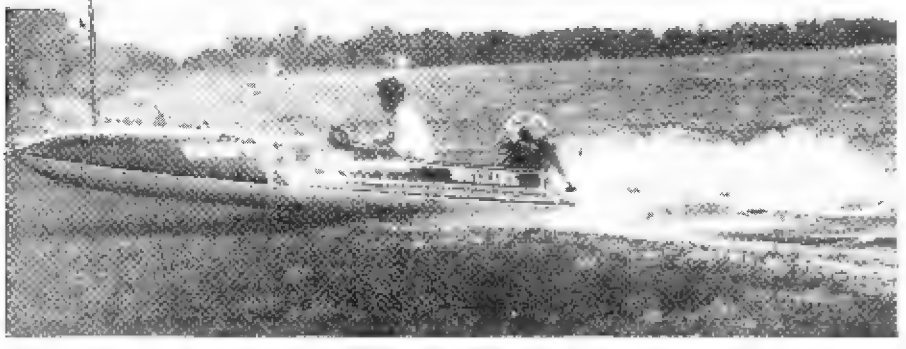
Where Outboards Bound *the* Briny

The end of a 659 mile ocean trip in an outboard driven open boat.

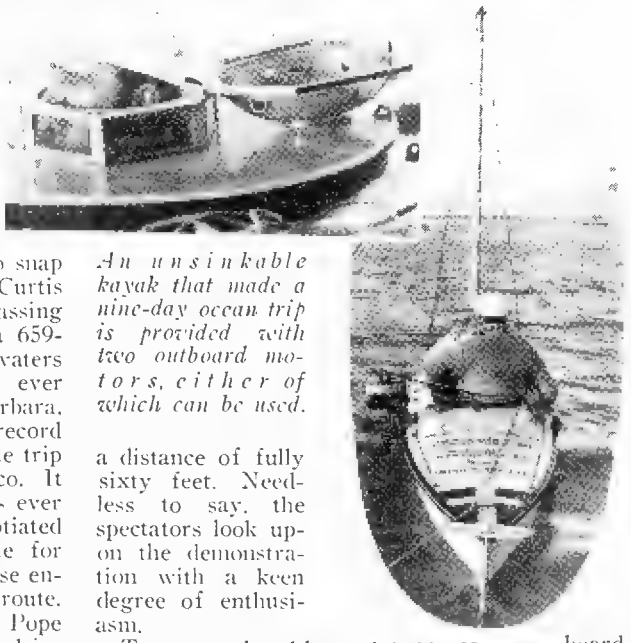
From the Arctic to the South Seas, the Outboard Motor Is Making Good . . . One Venturesome Outboard Craft Recently Rammed a Whale Near the End of a Long Voyage



Malcolm Pope, noted outboard star, drives his Torpedo Kid toward the shore at a fast clip, and then continues on land for sixty feet.

SOME of the most outstanding advances in the field of outboard-engine-propelled vessels are photographically depicted on this page.

The cameraman was on hand to snap the topmost picture just as Curtis Crang and Ralph Oppie were passing through the Golden Gate after a 659-mile trip through the roughest waters in which an outboard boat was ever driven. These two Santa Barbara, Calif., men set a deep-sea speed record of 45 hours and 57 minutes for the trip from San Diego to San Francisco. It is the first time that the trip was ever made in an open boat, which negotiated water hitherto thought impossible for small boats. The Johnson Sea Horse engine was refueled four times en route. At Winter Haven, Fla., Malcolm Pope has been getting quite a thrill by driving his steel boat into the beach at a very fast clip. The momentum sends the boat across stretches of land for a distance of fully sixty feet. Needless to say, the spectators look upon the demonstration with a keen degree of enthusiasm.

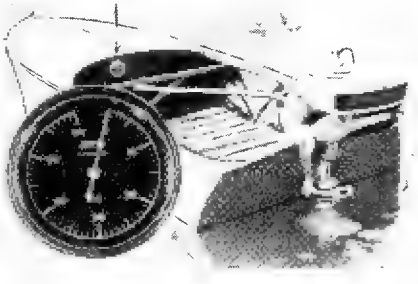


An unsinkable kayak that made a nine-day ocean trip is provided with two outboard motors, either of which can be used.

To prove that his unsinkable Kayak will be a satisfactory lifeboat for aircraft on transoceanic flights, Kai Pless-Schmidt recently made a nine-day ocean trip in his tiny craft from the Faroe Islands to Bergen, Norway. The trip ended in disaster when an eight-ton whale was encountered near the Norwegian Coast, and for three days and nights the vessel was tossed helplessly in the heavy seas until the pilot was finally rescued by a fishing boat. The craft can carry three persons, and there is enough room inside for folding rubber boats to accommodate an additional thirty-two persons. The boat may be equipped with two Sea Horse outboard motors, is unsinkable, and can be closed airtight. Only one engine was carried on the trial trip. In heavy seas the pilot shuts the cupola and lies down full length. The collision with the whale sixty miles off the Norwegian Coast induced the pilot to throw overboard his anchor and aluminum boards. The whale jumped through the water and swallowed the aluminum boards. Probably cut by these metal pieces, the whale lashed the water furiously and took the motor with him.

Even Waikiki has gone outboard. In many of the South Sea Islands, which have only recently graduated from cannibalism, outriggers are being driven (*Continued on page 378*)

Outriggers in many of the South Sea Islands are propelled by outboard engines in place of clumsy paddles worked by the crew.



Outboard tachometers are so arranged that they can be connected directly to the outboard engine and will at all times give an indication of the engine speed.

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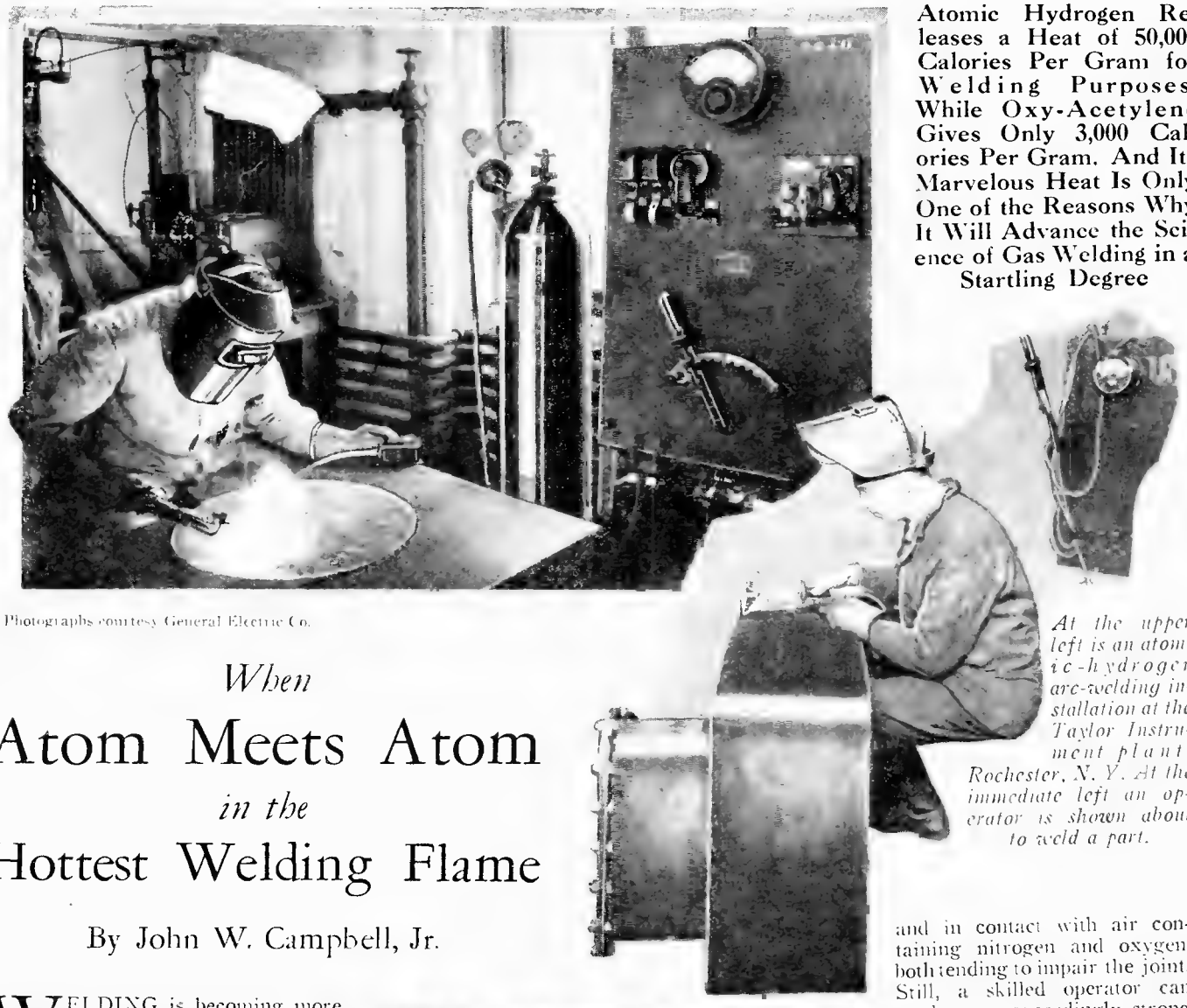
Atomic Hydrogen Releases a Heat of 50,000 Calories Per Gram for Welding Purposes, While Oxy-Acetylene Gives Only 3,000 Calories Per Gram. And Its Marvelous Heat Is Only One of the Reasons Why It Will Advance the Science of Gas Welding in a Startling Degree



Photographs courtesy General Electric Co.

At the upper left is an atomic-hydrogen arc-welding installation at the Taylor Instrument plant, Rochester, N. Y. At the immediate left an operator is shown about to weld a part.

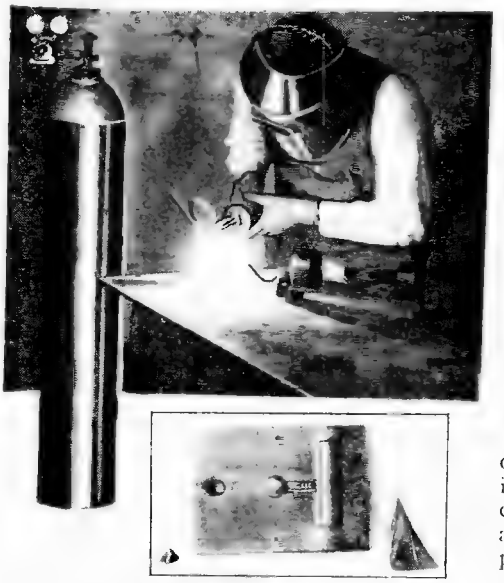
When Atom Meets Atom *in the* Hottest Welding Flame

By John W. Campbell, Jr.

WELDING is becoming more and more important in modern construction work. It has been proved time and again that a welded joint can readily be made stronger than the original material, and far stronger than a riveted joint. It is also a silent joint, both during and after the process.

One of the greatest difficulties in welding iron and its alloys by the gas flame is the fact that excessive amounts of carbon, nitrogen or oxygen injure the metal. If nitrogen gets into the welded metal, it weakens it and makes it crystallize and break more readily. If carbon enters, complex carbides of iron form, and the metal becomes brittle instead of ductile. Oxygen, as we all know, quickly weakens metal.

One of the principal methods of welding now used is the arc-weld, wherein the material of an electrode is melted and enters into the alloy of the metal being welded. During the process the metal is at all times surrounded and in contact with air containing nitrogen and oxygen, both tending to impair the joint. Still, a skilled operator can produce an exceedingly strong weld by this method. Another popular process is the gas-oxygen method. The fusible gas employed may be hydrogen, ordinary illuminating gas, or acetylene, the latter giving the hottest flame. These gases all contain carbon, and everyone knows how sooty an acetylene flame can be. If an excess of oxygen is used, the metal is oxidized; if too little is used, carbon enters the alloy. The skilled operator can produce a very effective weld by this means, however, for at a medium point the nitrogen of the air is kept out by means of the stream of burning gas.



The operation pictured above shows the atomic-hydrogen process in use on straight production welding of flowmeters at the Merriam Company's plant, Cleveland. Immediately above is shown a ductile weld on low carbon steel made by the same method.

Recently Dr. Irving Langmuir of the General Electric Research Laboratories has developed an exceedingly interesting and important new system, combining the advantages of the gas and arc methods, with an entirely new point of superiority.

It has been known for a good many years that hydrogen gas is normally composed of a swarm of molecules, each molecule containing two atoms. The chemist represents hydrogen gas as H_2, just as he represents two atoms of hydrogen in sulphuric acid as H_2SO_4. The hydrogen atom alone is represented simply as H.

Recently Dr. Langmuir succeeded in producing (*Continued on page* 358)

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How to Build a SCOUT

IN this picture the authors of our secondary glider construction series appear with the leading light, bar none, of American gliderdom—to wit, William Hawley Bowlus, builder of sailplanes, holder of the American soaring record and chief co-operator in Colonel Lindbergh's course in soaring flight. . . . The photograph was taken on the occasion of Mr. Bowlus' visit to Syracuse, where Herr Martin Schempp (right) serves as instructor for the Syracuse Glider Club, an organization of which Lieutenant Reynolds (left) is an outstanding member.

This Is the Second Article of a First Covered the Construction of ries the Building Process Through Cockpit, the Launching

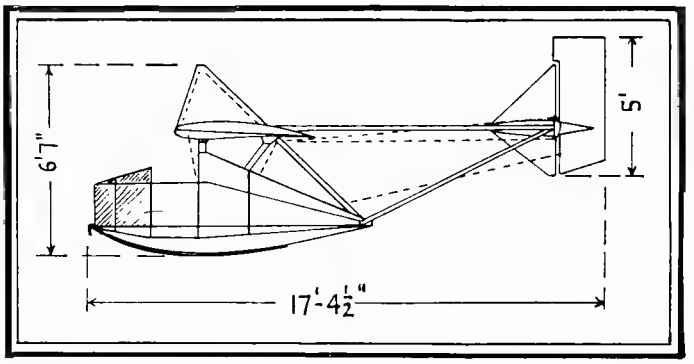
By Lieutenant H. A. Reynolds

THE leading edge of the wing is next to be considered. It is important to maintain this section of the airfoil under flying conditions. Thin plywood is ideal for this purpose and is used quite extensively. We find that No. 40 weight binder board can be used as a leading edge covering when it is properly treated and applied. This binder board is a tough cardboard furnished by paper supply companies. It can be cut in sheets long enough to reach between three ribs and wide enough to extend from the top of the front spar around to the leading edge of the wing and be secured to the bottom of the same spar. It is best to coat the whole inside area of these sheets with waterproof glue and fasten them to the leading edge while the glue is wet. ⅜"x21 gage brass nails can be used to hold them in place and strips of muslin soaked with glue can be neatly stretched over the crack where they join each other. This makes a very smooth leading edge of surprising strength. After the glue is dry a coat of spar varnish can be applied to the outside surface to further weatherproof it.

The entire wing panel should now be braced with No. 30 piano wire which is tightened by small standard airplane turnbuckles. The turnbuckles are fastened to the metal fittings on the front spar where they are easily reached for adjustment. Double wires and metal fittings should be installed in the last two sections at the wing tips. The fittings should have at least 2½" space up and down between them. This forms a type of box bracing that is light and very rigid. The method of bending and forming the hard wire ends is shown step by step in a drawing of this operation. Slip two spiral ferrules, made of No. 30 piano wire, on each bracing wire before the bending is done so that they can be slid in position when fastening the wire to the metal fittings and turnbuckles. These spiral ferrules can be purchased ready made from airplane supply companies.

Secure four aluminum aileron pulleys of 4" diameter. These pulleys should be mounted into two sets of strap and hinge mountings as shown in the aileron pulley drawing. Each aluminum pulley is pivoted in a strap side sheave which is bent from a single strap of No. 14 carbon steel and held in shape by two rivets. Hinge plates are cut from No. 14 carbon steel and drilled for the pulley sheave clevis pin. The hinge plates are also drilled with a ¼" hole for bolting to the spar. One set of two aluminum pulleys is bolted to the inside of the front main spar in such a position between the ribs as to be clear of the bracing wires. A spar plate of No. 14 carbon steel is used as a spacer for the mounting bolts. This serves in place of washers under the nuts on the opposite side of the spar. The pulleys should not bind in any way and their strap mountings should move freely up and down in the hinge plates so that the pulleys and the aileron cables will be in perfect alignment at all times.

The center section of a glider should be constructed with great care as it is the junction which serves as a landing gear and attachment point for wings and tail. The glider pilot's life may depend on the type of work incorporated into this important part of the machine.



Here is a side view of the SCOUT Secondary Glider, showing the major dimensions from this angle.

The exact shape of the center section is drawn on the floor and small blocks of wood nailed along the lines, so forming a large jig. Spruce beams are provided 2¾"x1⅜" cut to the various lengths shown in the center section drawing, and fitted into the jig on the floor. Triangular spruce blocks are sawed out and fitted at the different joint positions in the cabane and runner as represented by dotted lines in the drawing. The runner proper is formed of 1⅜" square spruce strips held in shape by spruce uprights which are secured by triangular spruce blocks carefully fitted and glued in their respective places, so that they afterwards meet with the bulkheads of the cockpit (see cockpit drawing for measurements). This runner will be required to stand many repeated hard strains in gliding service and we cannot emphasize too strenuously the importance of securing each connection as strongly as possible. Sound, well-glued joints are a necessity in a tough runner.

The sides of the runner and also the sides of the cabane (the pointed top of the center section) are next covered with

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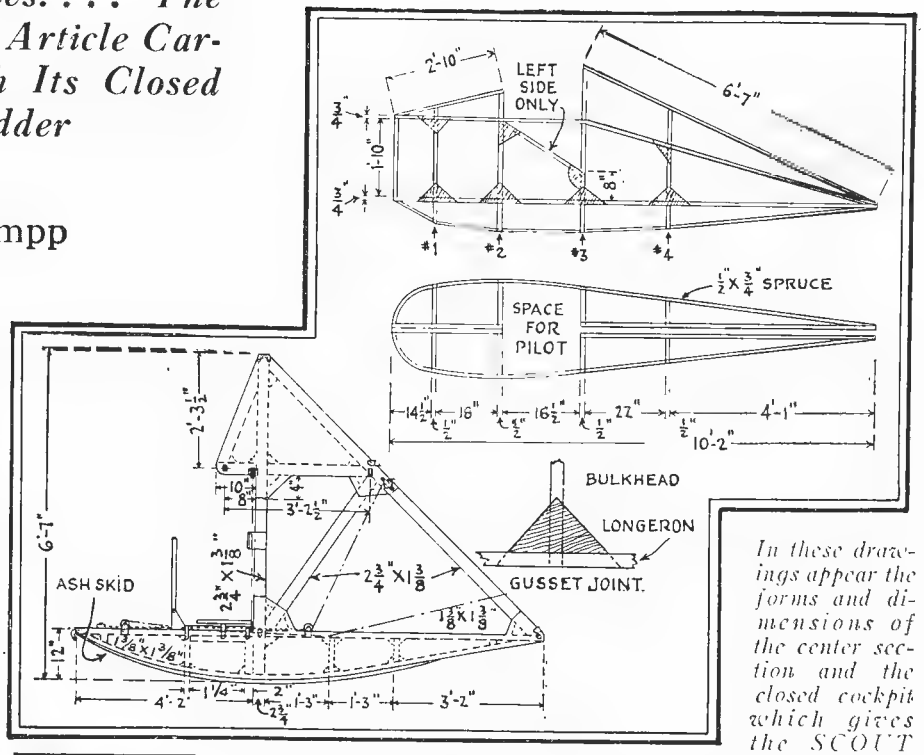
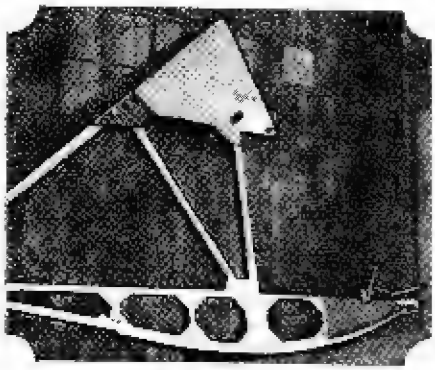
Secondary Glider

Glider Construction Series. . . . The the Wings. The Present Article Car- the Center Section with Its Closed Hook, Elevators, and Rudder

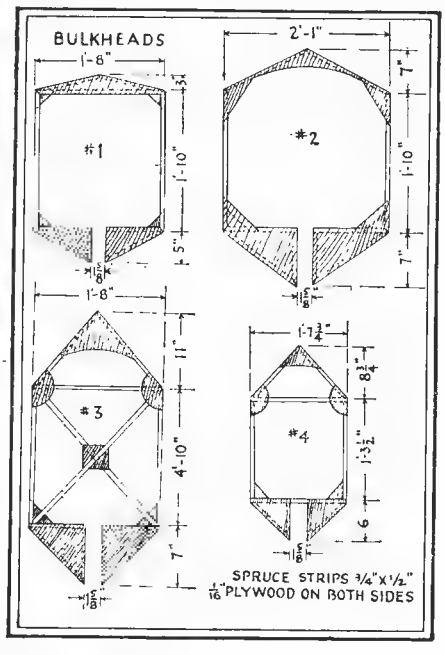
and Herr Martin H. Schempp



In these drawings appear the forms and dimensions of the center section and the closed cockpit which gives the SCOUT its lessened resistance and superior gliding angle.



The center section as the authors built it is shown in this picture.



plywood. The European Wood Products Co., Inc., 404 Fourth Ave., New York City, sells a 3/32" birch plywood in 40"x48" panels. The plywood can be sawed into shape and glued into place, where it is held by 3/8x21 flat head wire nails driven in about 1" intervals from each other. The nails simply hold the plywood firmly in place while the glue is drying. To protect the runner in landing, an ash skid 2½"x½" and about 7' long is screwed on. Mark with a pencil on the plywood the exact position of all the uprights and blocks in the runner to facilitate attaching fittings and bulkheads later on.

Four light bulkheads are next constructed of spruce strips ¾"x½" and 1/16" plywood glued and nailed on both sides. They are secured to the runner which fits into their opening at the bottom. The measurements for placing the different bulkheads on the runner are given in the drawing showing the longeron locations in the fuselage and must match with the pencil marks on the plywood. The longerons are ½"x¾" spruce strips glued and nailed into place onto the bulkheads, using large triangular plywood gussets for stiffening the joints, as shown in drawing. The long longerons which form the rounded nose of the fuselage should be steamed to take the smooth bend necessary to form them without splitting or breaking. It is a good plan to steam these strips and then bend them to shape between large nails driven into the floor to hold them in correct shape while drying. Glazed cardboard, such as is used for store window display signs, is next glued and nailed around the front of the fuselage running back to the second bulkhead. This cardboard is given a coat of spar varnish on both sides as soon as its attaching glue is thoroughly dry. This cardboard will prevent the cloth which is later applied from sagging and forming pockets.

The wire attachment metal fittings can next be made and fastened onto the center section. The pilon clamp No. 9 is made of carbon steel. This is one fitting and is bolted to the top of the cabane with ¼" machine bolts. The holes which receive the steel wires holding the wings should be bushed with copper. The front flying wire clamp No. 8-a is made of carbon steel. It consists of two halves with two strengthening strips which are bolted on each side of the main 2¾"x1⅜" spruce upright where it fits inside the runner. Three ¼" machine bolts passing clear through the runner at this point hold this fitting in place. Place this fitting well towards the skid so that the flying wires will not bear against the bulkheads or longerons. The holes for the front flying wires should be bushed with copper in this fitting also.

The rear flying wire clamp No. 8-b is made of carbon steel. It is located at the lower end of the long 2¾"x1⅜" spruce upright where it joins the rear end of the runner. This is made in two halves and is bolted on each side of the spruce and plywood member with ¼" machine bolts, running clear through the wood.

The launching hook is cut from ⅛" thick carbon steel to the form and dimensions shown in the drawing. This hook fits snuggly in a slot sawed in the nose of the runner wood work to receive it. It is held by three ¼" machine bolts.

The rudder bar is made of ash. Dimensions are given for a rudder bar which will be a very snug fit inside the cockpit. The builder may shape it short enough to allow full freedom of movement for the *(Continued on page 364)*

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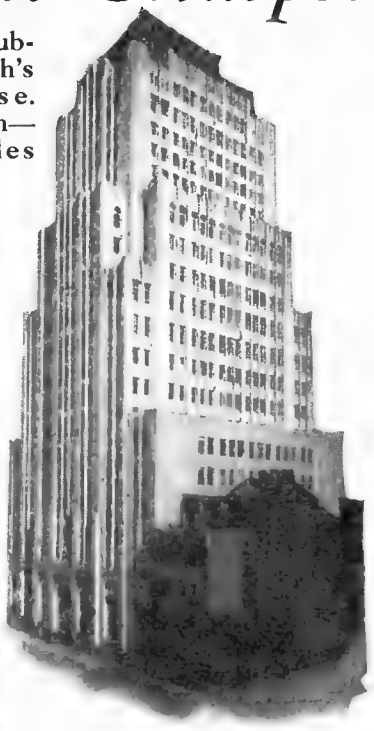
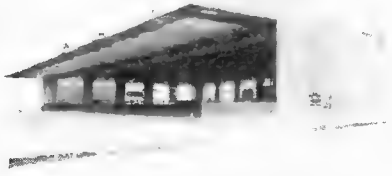
Cleveland—
a Scientific Glimpse

St. Louis Was the Subject of Last Month's Scientific Glimpse. Next Month—Los Angeles

The Avon station of the Cleveland Electric Illuminating Company, shown above, has an installed capacity of 140,000 kilowatts and will be enlarged as the demand requires. The three turbo-generating units pictured have a rating of 35,000 kilowatts each. The plant is located on the shore of Lake Erie, 23 miles west of Cleveland's public square.



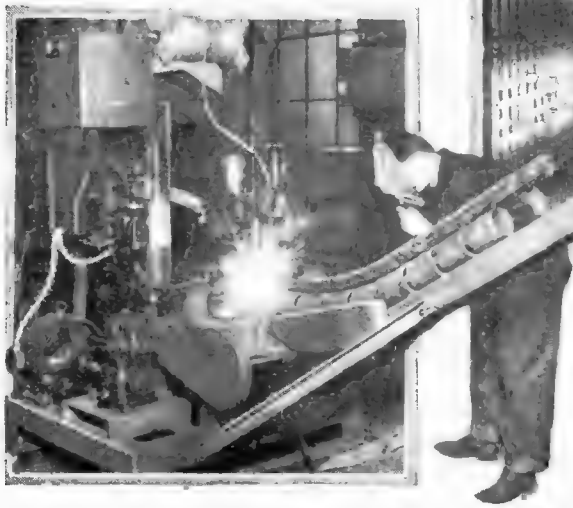
Characteristic of the service it represents, the Ohio Bell Telephone Company has built this fine modern structure to house its Cleveland headquarters. . . . The slotted effect in front permits maximum light and carries out the vertical lines needed in the skyscraper form. The design of the building reminds one of the Fisher building in Detroit, just up the lake a ways.



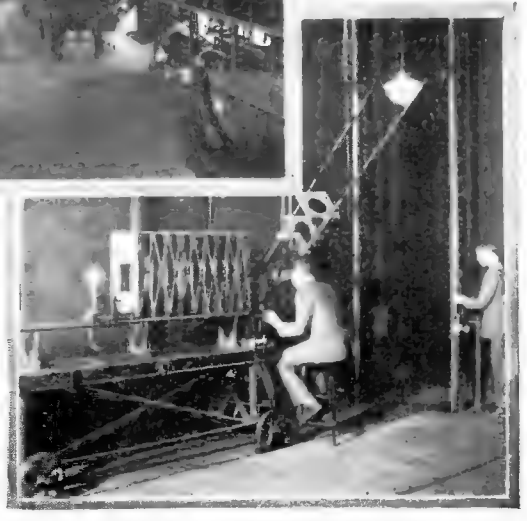
With 24,000 square feet of floor space, this hangar erected by the Austin Company at Cleveland's airport has but a single supporting pillar. The entire structure is built on the cantilever plan. The cantilever doors move out of the way in eight seconds, and can be operated either independently or en masse. . . . The Austin Company has made an international name for itself by its production of buildings complete, and has been engaged by the Soviet Union to erect an entire industrial city.

Along the Cuyahoga River, which bisects the city, Cleveland has an industrial Valley of Ten Thousand Smokes. This view of a car unloader at work is typical.

In the Mazda Testing Laboratories shown at the left, thousands of electric lamps burn continuously, day and night.



Above is pictured a workman welding a stator frame by the electronic tornado method, a process developed by the Lincoln Electric Company.



At Nela Park is located a three-story photometric laboratory, where thousands of reflectors and accessories used in electric illumination are tested annually. Nela Park is the home of the Mazda lamp in Cleveland.

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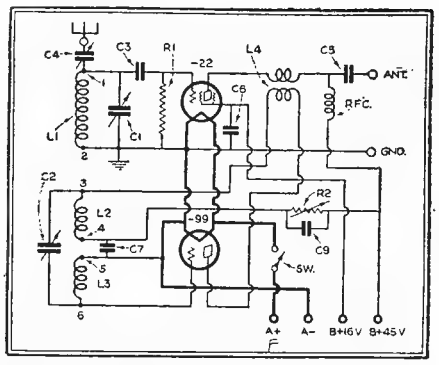
Plug It In! Get Those Short-Wave Stations!

By Volney D. Hurd

The Supersonic Short-Wave Adapter Plugs Into the Radio Frequency End of Your Receiver and Brings in the Short-Wave Stations. Four Plug-in Coils Enable It to Cover 14 to 115 Meters

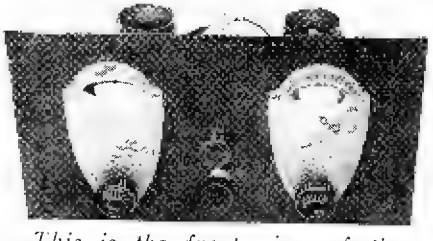


Here is the schematic diagram of the Supersonic short-wave adapter. The posts marked "Ant." and "Gnd." connect with the antenna and ground posts of the broadcast receiver.

IF someone handed you a gadget, whether you knew anything about radio or not, and told you to plug into your present radio receiver, pull in London, Eindhoven, Holland, or possibly Tokio, Japan, you'd probably be more than delighted with it. You'd get all the thrills that the short-wave fans have been boasting of, and in addition you'd need no additional receiver. You can have such a gadget if you care to build this "Supersonic" short-wave adapter.

Previous to this time, available short-wave adapters or converters have plugged into the detector tube socket of the broadcast band receiver and utilized the audio stages for sufficient amplification. This procedure has been found slightly less than satisfactory, due to a multitude of technical reasons which might best be described in a treatise of the most scholarly type. Take our word for it, though, they're not so hot.

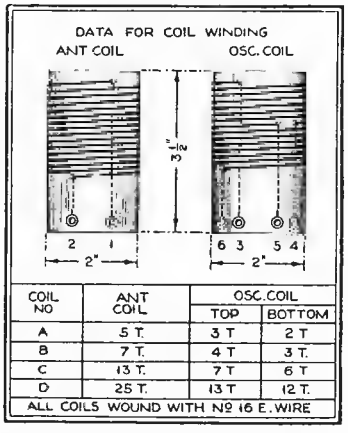
The Supersonic short-wave adapter works on a principle similar to that of the long-wave super-heterodyne. That is, the incoming radio frequency wave is heterodyned and changed to a longer wave in the midst of the broadcast band, and the radio frequency stages of the broadcast receiver are used as an intermediate frequency amplifier. This principle makes use of that part of your broadcast band receiver which just didn't exist when you plugged the short-wave adapter into the detector. In doing this it eliminates the "hash"



This is the front view of the Supersonic short-wave adapter in its completed form.

usually heard in the loud-speaker when the short-wave converter was doing its stuff.

The circuit consists of a detector or mixing tube coupled to an oscillating tube circuit, the output of which feeds into the first radio frequency stage of the broadcast band receiver. A small series condenser couples the antenna to the detector circuit, permitting the use of antennae of various lengths. This condenser can in turn come in at a tap on the coil or on the grid end.



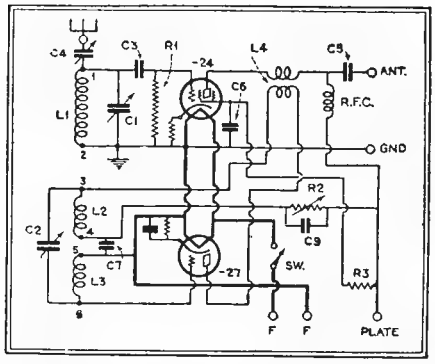
COIL NO	ANT COIL	OSC. COIL	
		TOP	BOTTOM
A	5 T.	3 T.	2 T.
B	7 T.	4 T.	3 T.
C	13 T.	7 T.	6 T.
D	25 T.	13 T.	12 T.

ALL COILS WOUND WITH Nº 16 E. WIRE

If the builder cares to wind his own coils, he will find complete specifications given above.

A simple coil only is needed here. This is tuned by a small variable condenser of the 270-degree type, permitting dial action for three-quarters of a revolution. This gives a very desirable separation of stations and provides for easy tuning. The regular condenser and grid leak are connected in the usual manner.

The oscillator circuit is one detail which caused the designer considerable trouble in his development work. It works extremely well at all wavelengths. The usual grid-coupling methods were tried, but the short waves played all sorts of tricks; absorption points and the tuning of the oscillator affecting the tuning of the input circuit were common faults. Finally, the coupling of the plate was accomplished with a special coupling coil, or rather a pair of coils wound on a common form.

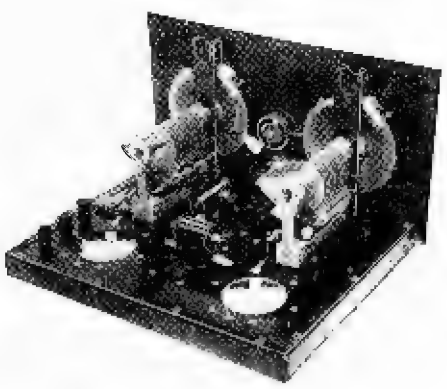


Current supply from your electrically operated receiver may be used on the Supersonic. The leads from the adapter go to a special base plugged into the detector socket of the broadcast band set.

The only variable element entering into the unit is the resistance R2, which, by controlling the plate voltage of the oscillator, also governs the amount of energy transferred to the detector. This is particularly useful in clarifying music received from short-wave broadcasters.

Although with a 199- and a 222-type of tube the amount of "A" battery consumption is very small, and in spite of the fact that two small dry cells will supply the plate voltage for quite some length of time, an AC version of the Supersonic adapter is shown. In order to utilize the current supply from your broadcast band receiver, it is necessary only to connect the various battery leads to the prongs of a socket which fits over the prongs of the regular tube base. The detector tube is best suited as a source of current, for the usual detector plate supply is 45 volts. A suitable resistance across the plate lead will give the necessary current supply for the screen-grid. This factor will, of course, depend on the potential of the plate supply. In the case of obtaining the supply from the detector tube, a resistor of 1000 ohms will suffice. . . . This is only a suggestion, and one may have to juggle the arrangement around before smooth performance is obtained.

(*Continued on page 377*)



Compact and neat is the Supersonic adapter viewed behind the panel.

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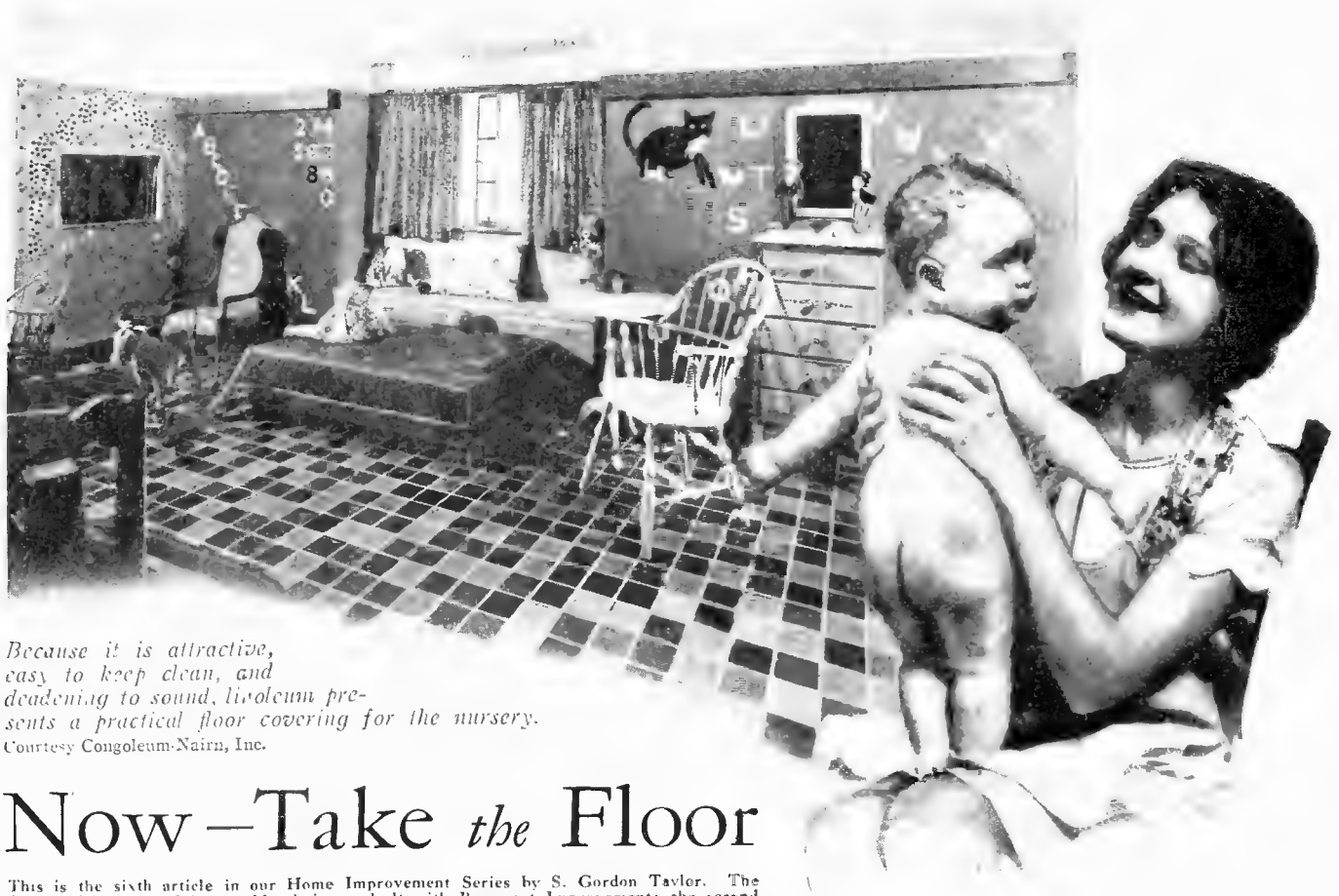

Because it is attractive, easy to keep clean, and deadening to sound, linoleum presents a practical floor covering for the nursery.
Courtesy Congoleum-Nairn, Inc.

Now—Take *the* Floor

This is the sixth article in our Home Improvement Series by S. Gordon Taylor. The first, which appeared in our March issue, dealt with Basement Improvement; the second (April) covered Insulating the Home; the third (May) dealt with Roofing; the fourth (June) was devoted to Paints and Decorations; the fifth (July) to Bathrooms. The September article will deal with Fireplaces and Heating Equipment. Wiring will be the subject in October.

By S. Gordon Taylor

THE selection of flooring materials for new homes and the treatment of floors in existing homes have in recent years presented real problems to the home-builder and the home-owner. In the days of the overall carpet the problem was simplified. But with the floors partially exposed by rugs, the problems developed. Not only do exposed floors become an integral part of the room and of its decorative scheme, but they become subject to the hardest kind of wear.

A practical floor for present-day conditions is one that blends with its surroundings, provides an attractive background for furnishings, is wear-resisting and easy to keep clean. In the average house its cost will be an important consideration. Therefore wood is admirably adapted for the flooring (*Continued on page 374*)

A linoleum pattern that simulates wide planks for an old English room.
Courtesy Congoleum-Nairn, Inc.

Random lengths and widths give an air of informality to this antique floor of pegged maple planks.
Courtesy National Association of Lumber Manufacturers

Spreading waterproof cement in seams and under edges of linoleum to seal the openings.
Courtesy Armstrong Cork Company.

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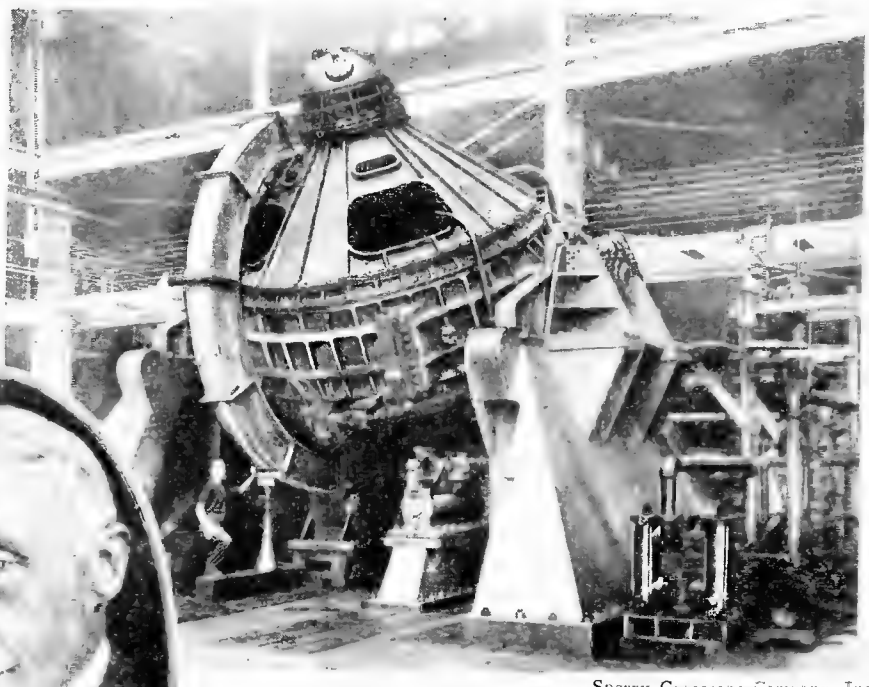
The Man Who Rocks *the* Deep

By Muriel Cameron Bodkin

Dr. Sperry Has Invented the Gyro-Compass, the Gyro Airplane Pilot, and the Gyro Ship Stabilizer, Which Not Only Resists the Ocean's Waves but in a Calm Sea Can Roll the Boat and Make Waves



Sperry Gyroscope Company, Inc.

The Sperry gyro-stabilizer shown above is one of the largest ever built. In action it enables a 20,000-ton ship to maintain an erect position in defiance of the roughest storm . . . Inventor Elmer Sperry appears at the left. . . . Below—Dr. Sperry explains the principle of the gyroscope to Viscount Shibusawa of Japan.

A CHILD'S top whirled on the nursery floor, and three small boys crouched before it. On and on it spun, weaving its spirals so fast that the spokes of the little gyroscopic wheel were lost in a flashing disk. This was the finest top in the world. Their father had sent for it all the way to Germany. While the children marveled at the toy, their father, Elmer Sperry, noted once more the four gyroscopic principles that were to revolutionize several industries; (1) the part played in the device by the gyroscopic "muscle," (2) the directive power of the gyroscope, (3) its persistence in plane and (4) its ability to multiply angular velocity. Although various inventions have been developed along other lines, exploiting gyroscopic functions, these four fundamental properties remain the same.

The problem of the magnetic compass on warships was one that defied solution. Guns act as magnets; whenever they were fired, the great swivel movements sent the sensitive little magnetic needle quivering. The attraction exerted by these big guns often reversed magnetic conditions, rendering the compass practically useless. It was plain to Inventor Sperry that under the conditions, the only compass possible had to be a non-magnetic wheel. He began work on a gyroscopic compass, using a wheel of considerable weight, which, spinning at high speed, acted as the meridian seeking element instead of the familiar magnetic needle. No minute point such as suspends the magnetic needle in the ordinary compass could support this heavy gyro. How was this great mass, approaching 100 pounds, to be hung so that it could function with the freedom of the compass needle? This was one of the major problems that confronted the scientist. Another almost as difficult to solve lay in adapting the gyro-compass, as Dr. Sperry termed his device, to select the very small angular velocity afforded by the earth's rotation, rejecting at the same time the large angular velocities of the rolling and pitching of the ship. The gyro-compass could depend solely on the 1/14,000 of a radian of angular velocity per second of the earth's rotary action. Most of the powerful gyroscopic reactions have available many radians of angular velocity to produce results. These two paramount considerations had to be disposed of before the scientist could tackle the problems of damping and suppressing other disturbances affecting the perfect functioning of his invention.

With the completion of the gyro-compass, Dr. Sperry realized that his invention could be adapted to other services as important. It was made to serve as a complete azimuth base for automatic fire control for ordnance on battle ships, for the automatic control of gun turrets, mounts and range finders; for the automatic steering of ships through the gyro-pilot which the sailors nicknamed "Metal Mike." It was used to record the course of a ship, marking every change of the course with an accuracy of 1/6 of a degree, plotted against chronometer time.

The gyroscopic ship stabilizer, as perfected by (*Continued on page 366*)

The photograph below shows Dr. Sperry inspecting a detail of one of the gyroscope mechanisms in his laboratory.

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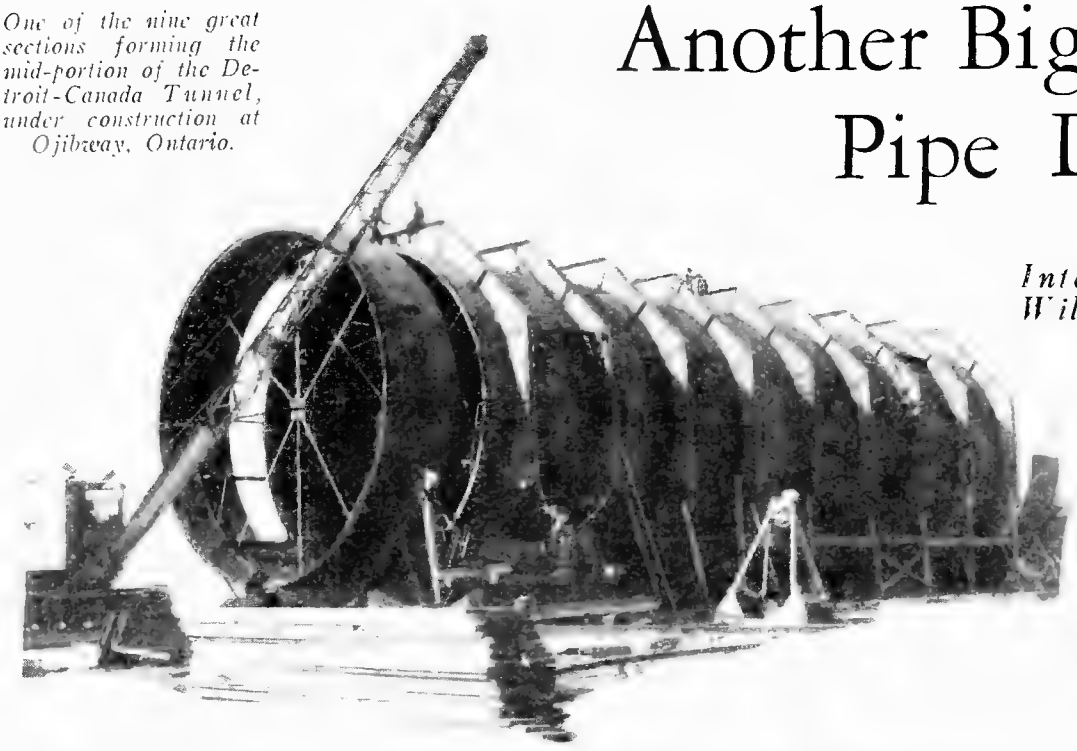
Another Big Traffic Pipe Down

One of the nine great sections forming the mid-portion of the Detroit-Canada Tunnel, under construction at Ojibway, Ontario.



International Tube Will Accommodate Motor Vehicles Between Detroit and Canadian Border Cities

By Harvey Klemmer

DETROIT, the automobile capital of the world, again is blazing new trails of automotive usefulness with the Detroit and Canada Tunnel, now being constructed under the Detroit River, between that city and Windsor, Ontario.

The Detroit tube has been under construction for the past two years, will cost in the neighborhood of $25,000,000, and is scheduled to open late this Fall. It will be the first international vehicular tunnel ever constructed and is designed to bring the downtown districts of Detroit and the Canadian border cities area within three minutes' traveling time of each other. On both sides of the river the terminals are located in the business districts.

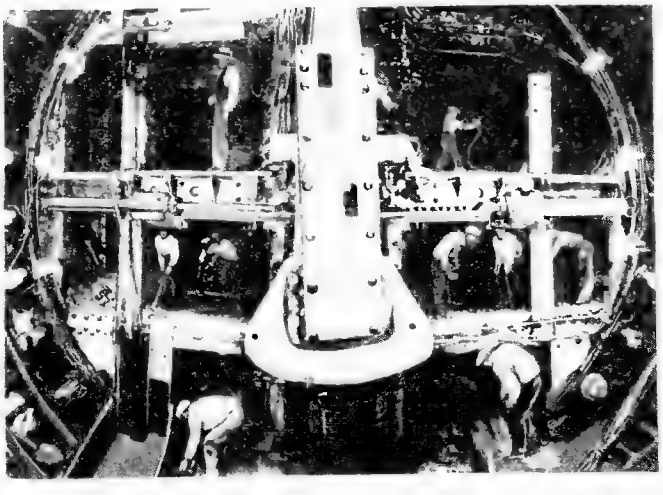
LATE this Fall a stream of motor traffic will begin to pour through the mile-long vehicular tunnel connecting Detroit with Canada beneath the Detroit River. The new tunnel has three traffic lanes—one for emergency use—and will handle 1,000 vehicles an hour. It cost $25,000,000 to build, and it will bring the downtown districts of Detroit and Windsor, central community of the Border Cities group, within three minutes' drive of each other.

Heretofore automobile traffic crossing the Detroit River at this point has been compelled to use the ferry system. Although the service has been excellent—as ferries go—traffic congestion has grown worse and worse, so that the trip has been avoided by many thousands of motorists. Now all that stands to be changed by the new mile-long automobile subway from the heart of Detroit direct to the heart of Windsor.

The new tunnel measures just one mile from street level to street level. It carries a 22-foot roadway, allowing for one lane of traffic in each direction and an extra lane to spare for emergency use. The capacity will be 1,000 vehicles

(*Continued on page* 356)

The Detroit terminal of the international tunnel lies within one block of two of the city's major business and traffic lanes.



This composite photograph conveys an idea of the method used to build about 1,700 feet of the new tunnel.

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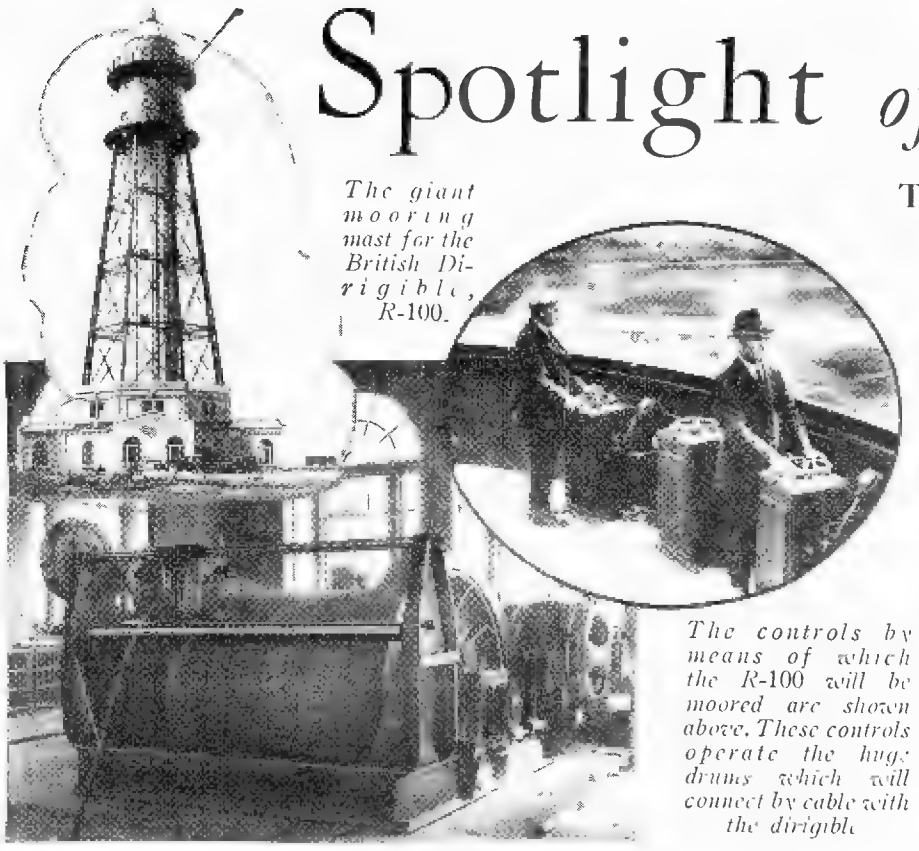
In the Spotlight *of* Science



The giant mooring mast for the British Dirigible, R-100.

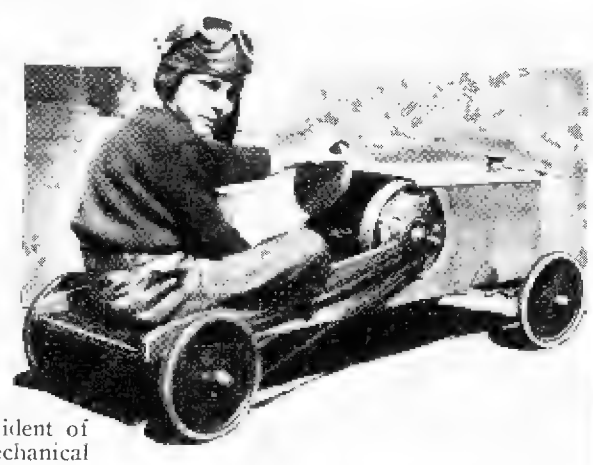
The controls by means of which the R-100 will be moored are shown above. These controls operate the huge drums which will connect by cable with the dirigible

The Latest in Dirigible Mooring Masts for R-100

A NEW mooring mast has been erected at St. Hubert, Quebec, at which the giant British Dirigible R-100 will be tied after it reaches Canada following its flight across the Atlantic. This mooring mast is the latest scientific development of its kind. It is 210 feet high, and inside the central cone water, gas and electric mains run to the top. From this point connections can be made to serve the dirigible with supplies. At the top are electric controls which communicate directly with the giant winch on which the cable is wound. The mooring cables will be paid out on the ground, and when cables are eventually released from the R-100 as it reaches the St. Hubert airport, the two will be connected together and the dirigible will be slowly drawn to its anchorage at the top of the mast.

Boy Builds First Dollar Car

A twelve-year-old boy was able to build a complete motor-driven automobile, that he could actually use, for the sum of less than a dollar.



A TWELVE - year - old Philadelphia youth, Robert Dodge, now seems to have the distinction of being the first boy motor manufacturer. He is shown here seated in his car which cost him less than a dollar to make. The car has been named Three Horse, because a small three horsepower engine is used to drive it. The engine itself is located directly in front of the driver, and the power it develops is communicated to the rear wheels by a chain and sprocket construction. Robert Dodge is the son of Kern Dodge, a former president of the American Society of Mechanical Engineers.

You can now have your ice rink poured for you, and you need not have a refrigerating plant to keep the artificial ice in fit shape for skating.

Chemicals and Water Make Suitable Ice for Skating

THE first American demonstration of a new invention known as Opal ice was recently given in New York by Max Heinrich Gurth, an engineer of Berlin. He is shown in the photograph here explaining the features of this invention to Frieda Peterson, a noted figure skater. A chemical mixture, the nature of which still remains a secret, when mixed with water produces a hard surface which can be skated upon the same as real ice. It is said that this chemical combination can be manufactured at a fraction of the cost of real ice. There is no upkeep to a skating rink made from this product. Opal ice can be used the year round. It does not melt even in the warmest lands, and there is no difficulty in resurfacing. Inasmuch as the product congeals at the ordinary room temperatures, costly refrigeration systems are not needed.

In Stuttgart, Germany, a large chemical ice rink has been built, which is in daily use. This rink measures 165 by 75 feet. The layer of artificial ice is less than three inches thick. Should the product become available on the American market, it is very likely that many basements will be converted into skating rinks so that habitues of the sport can indulge in the pastime.

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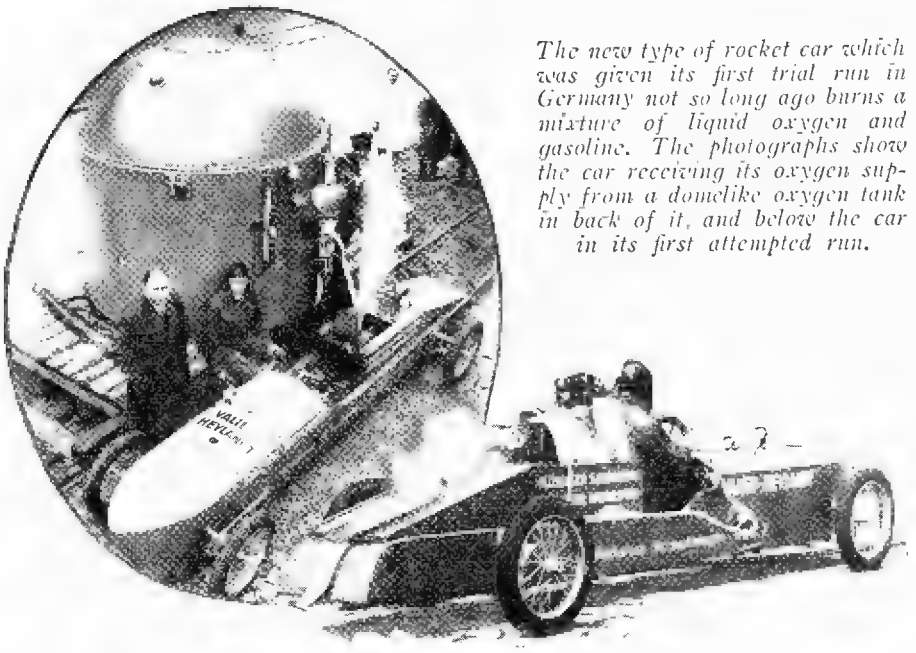
Rocket Auto Uses Oxygen and Gas

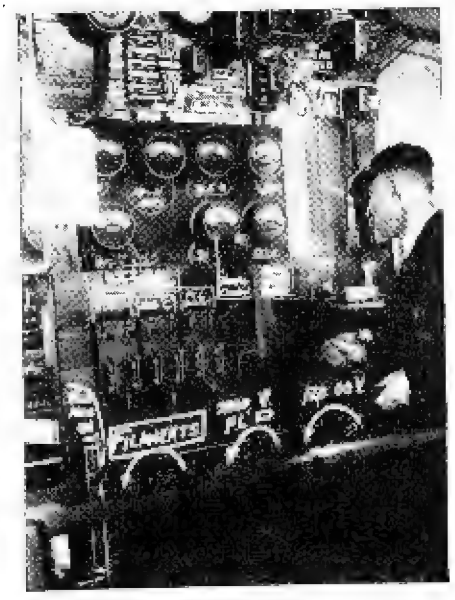


The new type of rocket car which was given its first trial run in Germany not so long ago burns a mixture of liquid oxygen and gasoline. The photographs show the car receiving its oxygen supply from a domelike oxygen tank in back of it, and below the car in its first attempted run.

GERMANY is still experimenting with rocket automobiles and rocket planes. The readers of this publication will well remember the descriptions of rocket cars and their operation which have been given heretofore. It will be recalled that one of the pioneers in rocket propulsion is Max Valier, who together with Dr. Paul Heylandt developed the latest style, which instead of using gunpowder to generate the gas that is to be employed in driving the car, uses a mixture of liquid oxygen and gasoline. The explosion of these two substances is supposed to result in a more positive drive that will be more constant than one obtains from gunpowder, and that can be increased or decreased in its violence. This regulation allows for a change in speed, not possible with gunpowder.

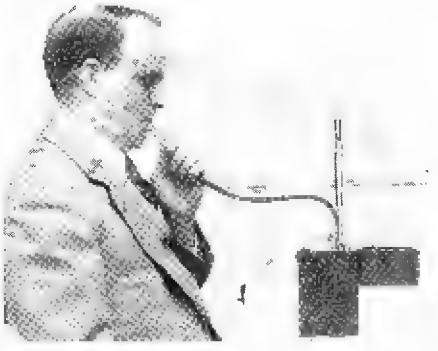
And Now We'll Radio the Moon

A RADIO signal will soon be sent to the moon, but Dr. A. Hoyt Taylor, superintendent of radio at the Belleview Naval Research Laboratory, who is going to send this signal, does not expect an answer. You wonder what can be the purpose of such an attempt? Dr. Taylor wishes to determine if there is an electrically charged layer in the upper atmosphere which would keep radio waves from escaping the earth.



Blow Into This Apparatus and Test Your Heart

HOW is your heart? We don't mean to be slangy. We are referring this sentence to the individuals who had their hearts tested by a new and simple little device that attracted much attention at the annual meeting of the Amer-



ican Physical Society when they met in their session at the Bureau of Standards in Washington. As the photograph illustrates, the mechanism is very small. You grasp the tube, hold it to your lips and blow into it. It has been claimed that heart ailments of relatively minor importance can be detected, and the mechanism will even determine slight heart conditions that might eventually reach a very serious stage if they were left untreated. The instrument was demonstrated by Dr. P. V. Wells.

Your Home Is Quite Unsafe

IN a set of figures compiled by the Metropolitan Life Insurance Company relating to non-fatal accidents, it has been found that the home is positively the worst possible place to be in. In a report from twenty-two Visiting Nurse Associations, out of 6,585 cases of non-fatal accidental injuries treated by them last year, 46 per cent occurred while the victims were engaged in domestic pursuits, 45 per cent occurred in public places, and only 9 per cent happened when the people were at work. Nearly twice as many people were scratched or cut in the home than anywhere else, and more people were accidentally injured by falls at home than by automobiles. More than four times as many children under five years of age were injured at home than in public places. The most common accidents were slipping in the bathtub, tripping on a rug, falling off chairs or stepladders, or burning oneself with a lamp, match or tea kettle.

Twisting a Two-Inch Steel Bar by Hand

IF you were given a two-inch steel bar and asked to twist it, you would probably consider the task impossible. Yet, in the photograph here, Miss Ruth Hillman is actually twisting a two-inch solid steel bar without seeming to exert any pressure. The bar in this instrument is rigidly locked at the bottom where it is set in a steel base. Mirrors are set on the apparatus in such a way that the product becomes a Michaelson angle interferometer. By looking into the tube, the spectator can see that the bands of light and dark areas change their positions when the steel bar is grasped and twisted. The instrument is so sensitive that it will easily measure a movement of a fiftieth of a millionth of an inch. Such supersensitive measuring instruments bring science down to a point of extreme exactness. When we can today measure the sag that takes place when a fly alights on a section of railroad track, we'll say it is getting down to a fine level.

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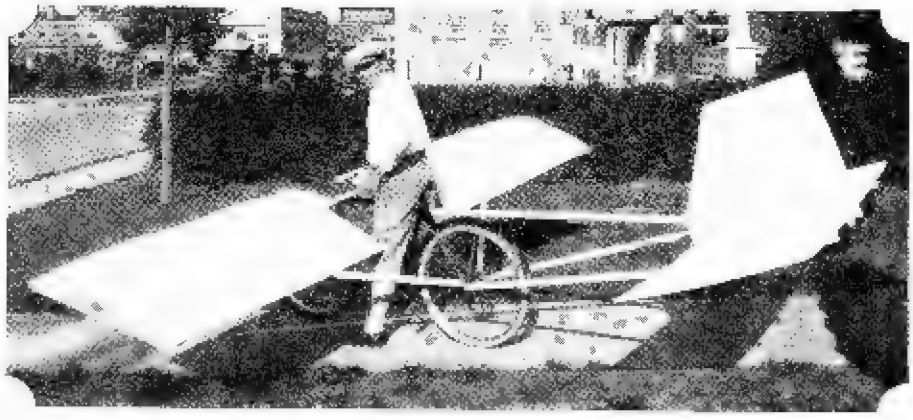
Largest Canal Lock in the World

FOR sixteen years the locks of the Panama Canal were considered to be the largest in the world. Now they have had to yield that honor to the locks on the North Sea Canal at Ymuiden. The new lock here is 1,312 feet long and 164 feet wide. The Gatun lock in Panama is 1,000 feet long and 110 feet wide. The new lock will enable the largest of passenger vessels to reach the docks of Amsterdam and engineers are confident that for many years no ship will be built too wide to enter. The Dutch claim to the origination of lock construction is disputed by Italy, which states that two of its engineers first invented lock constructions in the year 1481. In engineering circles, greater emphasis is laid upon the width of lock construction than length. There are some locks that are longer but none as wide as the present world's largest.

This Six-Cylinder Gasoline Engine Runs

AT the Motor Boat Show in Chicago, an exhibit that attracted a great deal of attention was a very small six-cylinder gasoline engine that was complete in every detail. This gasoline engine was fitted with carburetor, generator, magneto, distributor and oil pump, and what is more, it worked. Instead of compressed air, the motor burns gasoline just the same as the original after which it was patterned. The motor has a three-quarter inch bore and a one-inch stroke. Tests have indicated that it develops one-quarter horsepower. The entire construction was made by hand by C. H. Buchman, a Chicagoan who is now a student at the University of Illinois. It took him five years to complete the job, but you will admit it is a creditable piece of work. The photograph shows Miss Ethel Reed holding the exhibit. It is just such models as this that make excellent entries in the model trophy contest conducted by this magazine. So if you are a model enthusiast, don't fail to enter.

All the Thrills of Gliding Without Leaving the Ground



AND here folks we have what the inventor, Harry T. Nelson, who was in the U. S. Air Service during the World War, and is now a member of the Dallas Flying Club, at Dallas, Texas, calls a Bike-O-Plane or a Glide-O-Bike. As the photograph shows, the device consists of an ordinary bicycle to which is attached a set of wings and a tail. When driving the bicycle forward, the lift on the wings and the downward pressure against the constantly elevated tail, combine to lift the front wheel of the bicycle into the air. Thus, the front end of the bike is gliding along, while the rear wheel remains on the ground and furnishes the power. When in this position, lateral control is maintained by operating the front wheel, which is connected to the steering arrangement on the tail. The wings and tail of the construction are quickly detachable, and the bicycle can then be used in the regular way. The Glide-O-Bike offers a means of giving a young boy a half-way feel of the air. By increasing speed, the front of the bicycle is made to rise.

Testing the Toughness of Meat

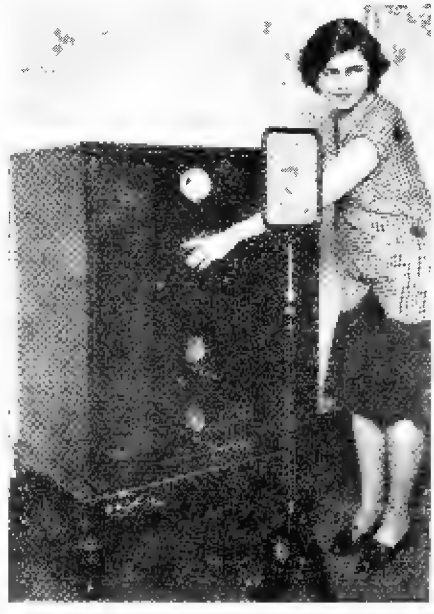
WE would not suggest that the average housewife purchase an instrument of this nature and take it with her on every shopping trip to the butcher's. Yet, if this were done, some butcher stores would soon close their doors. Just imagine ordering a steak and being positively assured of its tenderness. What a boon that would be to the housewife, and what a salvation to the lowly male coming home with his Saturday night's pay envelope.

K. F. Wrancr testing a piece of meat for tenderness.

The device in question is as yet in the experimental stage, but it is being used by the scientists of the Department of Agriculture to compare the tenderness of meat produced in different parts of the country under different natural environments. Eventually, the meat on the table might be better. Those butchers who are anxious to please their customers will insist on a territorial stamp on each quarter of beef. When using the instrument, a sample of the meat is placed in the machine and the scale measures the amount of pressure required to force a knife through it.

Television Included in New Radio

SOMETHING a little different along the line of television receivers was recently demonstrated at the Northwestern University circus. This receiver is fitted for the reception of both sound and television broadcasts. The outfit differs from the usual run of television receivers in that a screen mounted on a pedestal is placed in front of the receiver when the television images are to be viewed. The lens near the top of the cabinet projects the images on this translucent screen. There are two complete receiving outfits, either of which can be tuned to receive the broadcast. One is intended primarily for short waves, and the other for regular broadcast frequencies.



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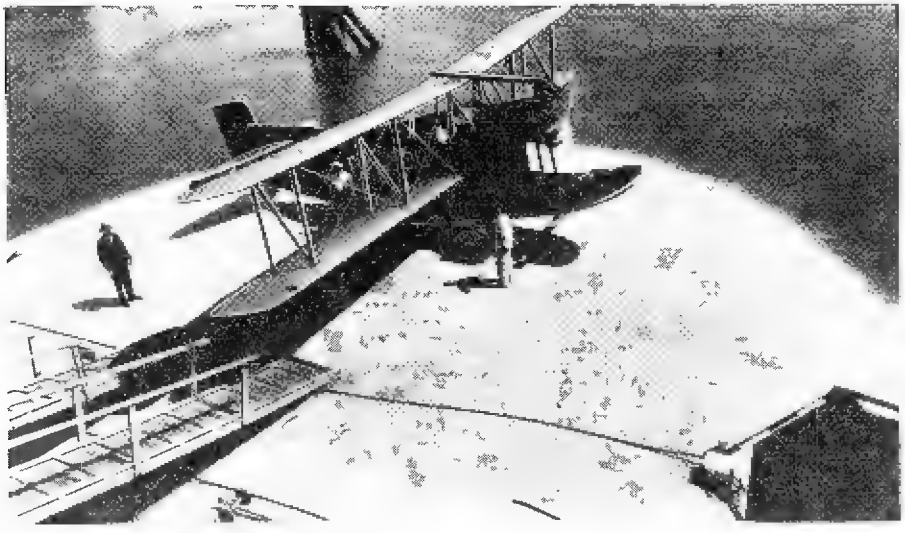
Air Ferries Land on Huge Floating Button



THE most novel airplane landing field in the world was recently installed by Air Ferries, Ltd., at the San Francisco, Calif., terminal. This has been nicknamed "the Button" by pilots operating the ferry. The Button is a large, floating field 500 feet wide, which is moored in place by suitable anchorages and heavy cables. The amphibion planes operated by this company come to rest on the water near the Button and then taxi toward the floating landing platform. By their own power, they crawl right out of the water and discharge their passengers on the 500-foot floating circle. This device has been constructed at a cost of $10,000. It is likely that as air travel comes into its own, the waters surrounding any city of appreciable size will be dotted with floating islands such as the one here illustrated.

Painting Submarine Views on Dry Land

MISS DOROTHY BECK, of Livermore, Calif., an amateur artist, has been traveling around the world making a collection of submarine paintings. She uses neither a diving bell nor a helmet, but does all of her work on dry land. Instead, she has had improvised for her an upside-down periscope. Two mirrors, placed at an angle of 45 degrees at both ends of a wooden tube, give her a perfect view of what is going on in the holes between rocks. She claims that in the water in these holes one can secure the best views of still and strange sea life. She is shown here spying on denizens of the deep along the tropical shores of Ceylon, and painting the scene.

Pluto Is Name of Planet X

SCIENTISTS of the Lowell Observatory have selected the name Pluto for the recently discovered Trans-Neptunian Body which was heretofore called Planet X. The name Pluto is symbolic of the comparatively dark and distant regions through which Planet X rides in its orbit about the sun. It will be remembered, by the readers of this publication, that Dr. Percival Lowell, founder of the observatory, predicted the existence of Planet X sixteen years ago. The announcement of the new name was made by Roger Lowell Putnam, trustee of the observatory and a nephew of the founder. Mr. Putnam said that he felt the line of Roman Gods for whom other planets are named should not be broken, and while the name of Minerva, the Goddess of Wisdom, would have been the choice, the suggestion was set aside because of the fact that an asteroid had borne that name for many years. The name Cronus, the son of Uranus and the father of Neptune, was also suggested. The American Astronomical Society and the Royal Astronomical Society were informed that henceforth the Planet X would be known as Pluto.

Umbrella Houses Camera Tripod

BECAUSE it is cumbersome to carry a camera tripod, especially when an umbrella also may have to be carried, a recent foreign invention takes the form of a combination of the two articles. Telescopic legs of the tripod can be folded together and concealed within the hollow shaft of the umbrella. The umbrella itself cannot be misplaced because it is integral with one of the legs. The photograph here shows the combination when ready for use.

A tripod that folds into the hollow shaft of an umbrella, is a unique foreign invention.

Electrically Operated Police Whistle for Traffic

AT SCOTIA, a suburb of Schenectady, N. Y., police whistles have been installed that sound a shrill blast just before the traffic signal lights change color. These devices are operated either electrically or manually, or may be automatically released by a mechanism within the base of the whistle itself. A piston contained in a cylinder is released by an electro-magnet, the resulting blast of air sounds a regulation police whistle, and in that way checks motorists who disregard the traffic lights or try to beat the light to a crossing. Experiments with the device have indicated that it also tends to speed up traffic. Photograph (from left to right) shows Chief William H. Funston, of Schenectady, Floyd Parks, and F. G. Jenkins, of Scotia, as they pose with the new traffic whistle.

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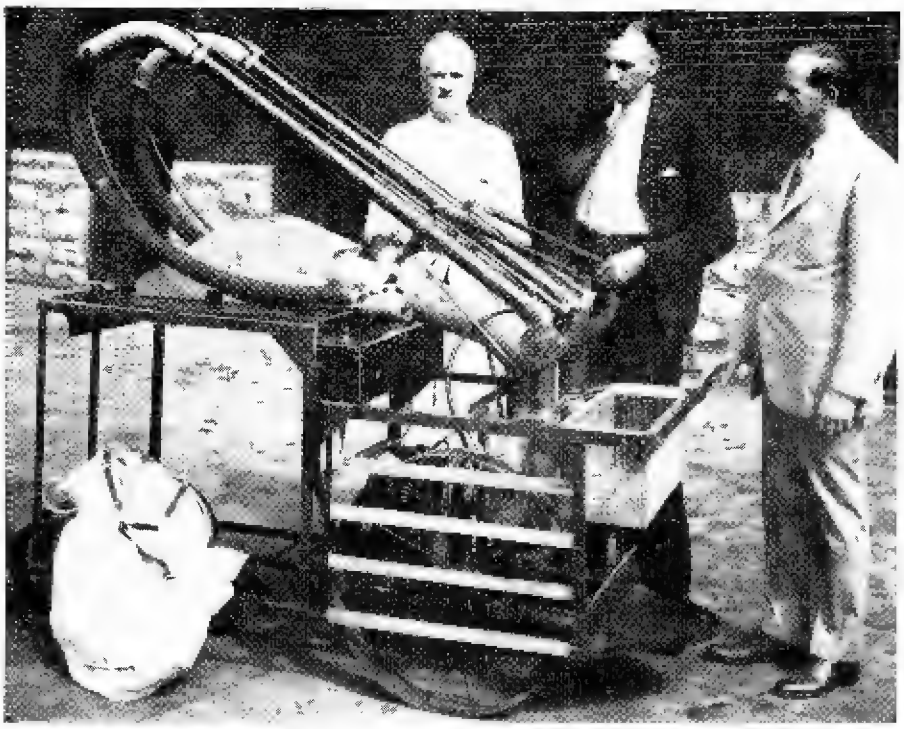
Gasoline Runs Automatic Cotton Picker

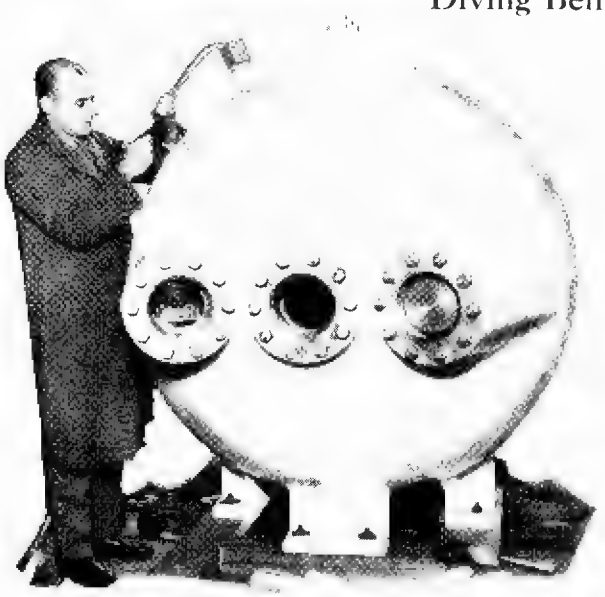
SINCE the invention of the cotton gin, very few novel advancements have been made in the cotton industry, and none has caused more interest than a recent mechanical cotton picker. This picker picks more cotton per roll from the bolls, and turns it into the gin cleaner than does any other mechanism. The device weighs but three hundred pounds, and will run all day on a gallon of gasoline. It can be pushed between the rolls and causes no injury to the stalks or growing bolls. Two revolving wipers, set in a light aluminum cage, draw the cotton from the boll, whereupon air discharges it against a screen grid, all fluffed out and well aerated. Dirt, moisture and foreign particles are removed when the cotton falls into a bag.—*G. Anderson Orb.*



What Ice to Use in Drinks

ONE very often hears stories about the relative purity of artificial ice when compared with natural ice. One also hears youngsters proclaiming that the white areas in artificial ice are impurities, or that artificial ice has an ammonia odor about it. Ordinarily, artificial ice is much better than natural ice for use in cooling drinks. While ice is generally cracked up and dropped into the liquid to be cooled, the practice is not to be generally recommended. This is not because the manufactured ice is impure when made, but because while it is being handled, delivered or otherwise carried, it is subject to contact with hands not altogether clean. You have often watched ice cakes slip from grasp and fall into unclean places from which the cakes were recovered, and then placed in your refrigerator without even an attempt at removal of the dirt. In this respect, the ice made by your artificial refrigerator is far superior to manufactured ice, the water for which may be even filtered four or five times. Homemade ice is not subject to much handling.

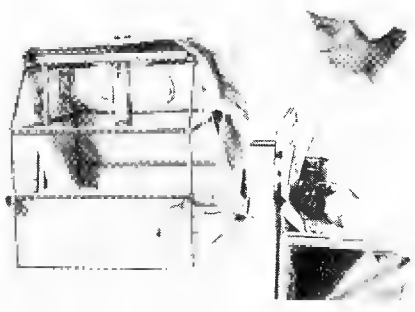
Diving Bell to Explore Ocean Depths



A DIVING bell designed by Otis Barton is now being constructed at the Museum of Natural History in New York, and when finished it will be shipped to the New York Zoological Station in Bermuda where Captain Beebe, the noted explorer, will use it to make observations at great depths. The front of the bell contains three eyes that are fitted with quartz glass discs three inches in thickness. Lights will be put in back of two of the discs, and the center one will be used for observation, or, if desired, the lens of a motion picture camera will be placed against it. The bell is made thick enough to withstand the great pressures to which it will be subjected. The observer within will operate practically under atmospheric pressure. The entire device will be swung from a boom on the mother ship. The surface ship will also supply the electric current for the operation of the lens. This current will be fed to the diving bell through an armored cable.

Electric Heater for Protecting Life

THE Vienna Maternity Hospital has had considerable success with a new electric heater that is being used for preventing death in premature births. The entire device consists of a cage-like structure that is placed over the infant. It contains several incandescent lamps and a thermostat. Heat is derived from the lamps and the temperature maintained fairly constant by the thermostat. It is claimed that the mortality rate in premature births has been considerably lowered as a result of the adoption of this invention.



A Talking Picture of You

IN Berlin, Germany, an enterprising inventor has developed a phonograph record that is also a photograph. The individual whose picture is taken inscribes his voice directly upon his own photograph. The invention makes it possible for you to send your photograph and verbal greetings at the same time.

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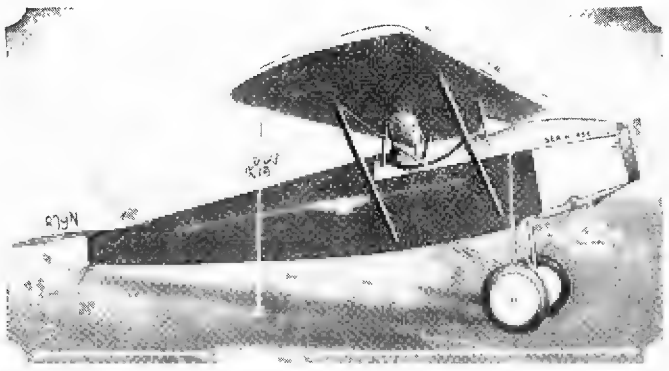
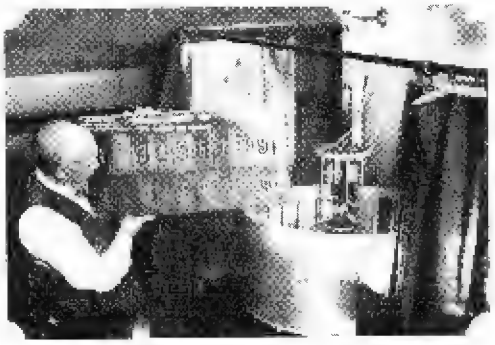
Marine Outboard Motor Drives Tiny Plane



OUTBOARD motors have become very popular with enthusiasts who daily drive small boats at great speeds in the waters of any harbor, river or lake. The absolute reliability of these motors has made some of the manufacturers turn to their possible development for aircraft. Here we have the first airplane to use a Johnson Sea Horse Outboard Motor for a power plant. The mosquito plane, weighing but three hundred pounds, was designed by Gernot Heinemann, of Bellingham, Wash., and recently made its first successful flight at Tacoma, Wash. Heinemann, a student at the University of Washington, equipped the Sea Horse engine with reduction gears and a propeller to adapt it to the air. The plane itself has a 25-foot wing spread, and is 16½ feet long and 7 feet high. The motor is the typical 32-horsepower outboard job, equipped for air cooling.

Accelerated Weather Tells Which Auto License Plates Fade First—Gloss, Not Color, Is Factor

SCIENTISTS of the Bureau of Standards at Washington have been carrying on a series of experiments to determine why some auto license plates fade in a very short time, while others last the whole season. Some license plates were given a glossy finish by applying a final coat of varnish, which was intended to preserve them. Others did not get the varnish treatment and were permitted to remain dull. Both dull and glossy plates finished in different colors, were then put in an accelerated weathering test machine and left there for thirty-seven days. In every case, the dull tags outlasted those which had been highly varnished. It is likely that in 1931, cars will be satin finished.



Mr. P. H. Walker, chief of the paint and varnish section of the Bureau of Standards, is shown with some of the sample tags that have been tested in the accelerated weathering test machine, also shown in the photo.

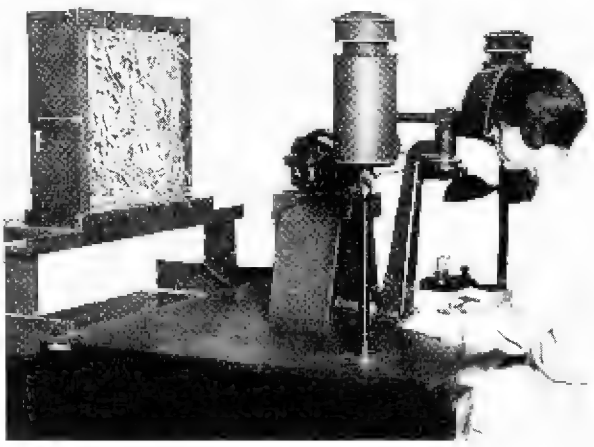
Hundred-Mile-an-Hour Metal-Clad War Airship

A BILL authorizing a new $4,500,000 metal-clad airship has been introduced in Congress. The plans for the construction were recently announced by Col. John A. Paegelow, commandant of Scott Field, Ill. The projected craft will be smaller than the Los Angeles, but will be intended primarily for war purposes. The ship will be 547.2 feet long and will have a maximum width of 119.5. It will displace 3,806,500 cubic feet of air, and will have a gas volume of 3,758,300 cubic feet. Eight engines developing a total of 4,800 horsepower, will give the ship a maximum speed of 100 miles an hour. The plans for the construction include provision for 30,000 rounds of ammunition, 137 millimeter gun, 5,000 to 15,000 pounds of bombs, ten machine guns, a 1,000-watt searchlight and two airplanes.

Phonograph Tests Pencil Leads

AN electrically-driven victrola has been converted into a machine for testing the lasting qualities of pencil leads at the Research Laboratory of the Westinghouse Electric & Manufacturing Company in East Pittsburgh, Pa. The photograph shows how the turntable of the machine is covered with a sheet of drawing paper, and a system of pulley wheels through one of which the leads under test project, is driven by the turntable. The leads come in contact with the drawing paper. As the turntable revolves, the pulley wheel mounted at the center of the disc also revolves. This pulley wheel drives two other pulleys by spring belt. The middle pulley contains four holes in which metal tubes are inserted. The leads under test are put in these tubes and downward pressure is applied to them by placing equal weights on each. Thus, as the turntable revolves, the pulley containing the leads revolves also, and the leads under pressure of the weights are in contact with the drawing paper covering the turntable. In this way, the wearing quality of four different types of lead, all under equal load, is compared.

A Hay, Apple and Cotton Whirler



THE Department of Agriculture, at Washington, D. C., has just announced the development of a machine that whirls hay, apples, cotton and other farm products at such a high rate of speed that the object appears only as a band of color. The color assumed by the revolving product is compared with colors that have been standardized for the various grades of the commodity that is to be marketed. Each individual lot is classified according to the color approximated by the test. Whirling the object has a tendency to combine the color values of individual parts, and presents a good average of the entire sample. The machine establishes automatically a mean for dark, light and middle tone values. It makes it unnecessary to test dark, light or medium samples, and automatically produces a result that can only be roughly approximated by normal selection.

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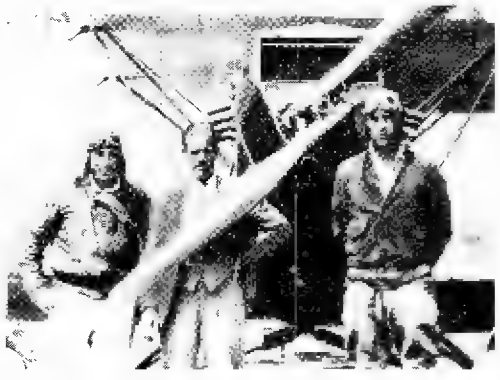
Boats That You Can Carry Under Your Arm

IF you plan to be near the water on your vacation, or intend to go into the woods on a camping trip, here is the type of watercraft that you should take with you. It is small and light enough to pack anywhere. The total weight of the boat and paddles is only forty-five pounds, and if you are near a gas station you need not even take a bicycle pump along, to inflate the boat. Use the free air at the station. These boats were tried out successfully on the Thames River at London, England, where this photograph was made. The interior of the boats remains dry at all times, and the pneumatic craft can be maneuvered as easily as any small rowboat. Each vessel is equipped with two oarlocks and two oars. When you are finished, pull the boat up out of water, release the air valve, and deflate the construction, fold it up and carry it away.

Students of Marine Life Have Undersea Classrooms

WHAT is believed to be the first undersea classroom in the world has just been organized by Dr. F. W. Person of the University of Miami. The students of marine life take weekly trips to the marine gardens in glass-bottom boats. Through the glass bottoms, they are able to observe the growths on the ocean bed. Reaching the scene of their studies, the students descend into a strange world on the ocean bed. On these expeditions they are attired in bathing suits and shoes. They then drop over the side of the ship, have a diving helmet adjusted to their heads, and slide down to the bottom. Here they can walk about easily and comfortably. Air for breathing is supplied by means of pumps on the surface boats.

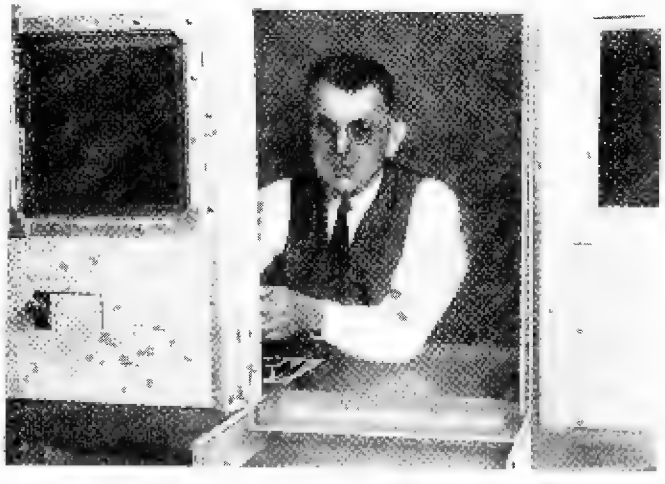
Few Moving Parts in Variable Pitch Propeller



Left to right—Gordon Sackett and Bert Hawkins, co-inventors of the geared variable pitch propeller, and Harry Crosby, chief mechanic, standing in front of the plane equipped with this invention.

ONLY three movable parts are found in a new variable pitch propeller that has just been invented by Gordon Sackett and Bert Hawkins. The pitch of this propeller is changed directly from the cockpit of an airplane. The operation is as easy as shifting gears on an automobile. By changing the pitch or bite of the propeller, the speed of a plane may be changed while it is in air without affecting the speed of the engine itself. Thus, the maximum speed for the plane can be obtained at will. When landing, the propeller can be reversed without stopping the motion of the engine, and the propeller then serves as a brake. On passenger planes the reversed propeller will not drive dust toward travellers.

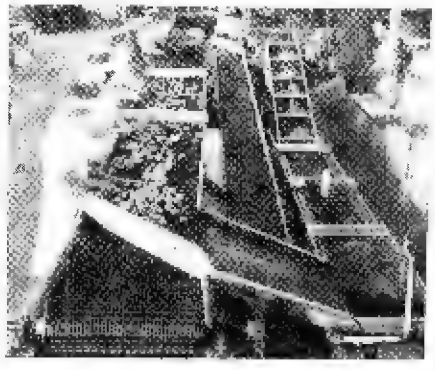
Bank Armor to Foil Bandits



THE Commercial Bank of Wichita, Kansas, has had installed a new bullet-proof tellers' cage to foil bank bandits. As one can observe in the photograph, the tellers cage is covered with steel thick enough to prevent penetration from bullets even if fired by a regulation U. S. army rifle. The teller himself works behind bullet-proof glass, and any money transfer can be taken care of through the slot at the bottom of the glass and between it and a suitable tray. At the least sign of trouble, he can pick up his automatic and push it through a special opening. From this position he can fire without being in any danger himself. Should a really clever bandit be able to approach the cage and poke his pistol through the opening provided for money transfer, the teller can duck behind the counter and come up with his gun ready for duty.

You Will Soon Be Able to Get New Irish Potatoes in Cans

WHAT is believed to be the only white potato canning plant in the world is now located at Palatka, Florida, in the heart of Florida's potato belt. After many years of experimentation, the Northern Potato Products Company has developed a process for canning the smaller of new Irish potatoes. These potatoes formerly went to waste. Now, thanks to the developments, the housewife can serve new potatoes all the year round. The potatoes are first blanched in very hot water. They are then conveyed by the machines and dropped into sterilized cans. Following this, all air is removed from the cans and the machine seals them up. The new adaptation opens up a different field in the canning industry. Products that may have been thrown away or perhaps converted into potato chips, will now be available in original and wholesome form. The housewife will not need to worry about serving her guests with black potatoes in those seasons when new potatoes are unavailable. Nothing seems to displease the hostess more than large discolored spots and she has frequently attempted to use milk and bleaching substances added to the water in which the potatoes are boiled in an effort to reduce discoloration. Now, that is no more.



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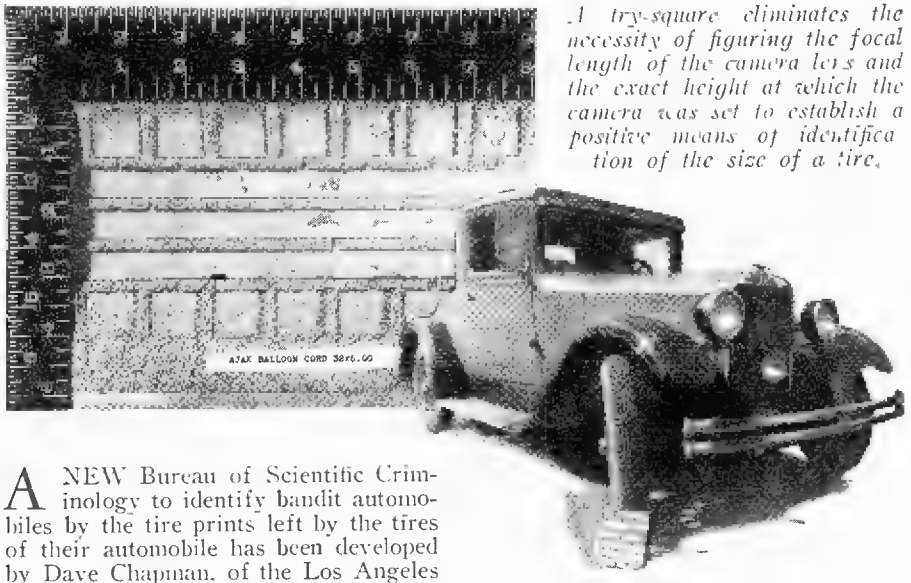
Fingerprinting the Tires of Your Auto



A try-square eliminates the necessity of figuring the focal length of the camera lens and the exact height at which the camera was set to establish a positive means of identification of the size of a tire.

A NEW Bureau of Scientific Criminology to identify bandit automobiles by the tire prints left by the tires of their automobile has been developed by Dave Chapman, of the Los Angeles Sheriff's Office. Heretofore a mathematician was needed to give comparative figures for any tire photograph so that correction could be made for the focal length of the lens and the exact height at which the camera was set when tire photographs were made. Mr. Chapman has substituted for these calculations, an ordinary try-square which he lays directly upon the mark. This proves a positive means of identification of the size of the tire, and provides other information which is always available for comparison. The measuring device being photographed at the same time and distance as the tire print eliminates any disputable question that might arise. The photograph shows the front wheel of the car which left prints that after identification by this method caused the arrest of the occupants of that car.

There are in existence in the neighborhood of 450 different patterns of tires.

Where an Earful Is a Bushel, at Least

AN immense model done in wax of the human ear, part of which is in cross-section, so as to show the position occupied by the bones in the middle ear, the ear drum and the Eustachian tube, is one of the exhibits in the new German hygiene museum just opened in Dresden. The size of the ear can be perceived by comparing it with the workman.

Television Shows Pilots Landing Field Through Fog

A NEW radio eye that enables the pilot actually to see the scene below him even though he may be flying in a dense fog has just been invented by John Hays Hammond, Jr. The television screen is placed ahead of the pilot in the cockpit of the plane. The system of operation is quite a bit different than in ordinary television. Somewhere in the vicinity of the landing field there are three radio compass stations equipped with direction finders. An automatic radio transmitter on the plane broadcasts a continuous signal. The operators at the compass station train their direction finders on the plane and definitely locate it.

The bearings that are obtained are automatically transmitted by land wire to a television transmitter near the airport. The point at which the three bearings cross is the exact position of the airplane in the sky. At the television transmitting station there is a miniature reproduction of the airport and the surrounding territory. Every hill, tree, wire and rope is located on the model in exactly the same position that it really occupies. Above this model is the scanning disc and photo-electric cell of the television transmitter. This television eye, as it might be called, bears the same relation with reference to the model as the airplane does with reference to the field itself. It is supported on three arms and moves in accord with the data obtained from the compass station. The pilot on the plane sees a speck moving across the television screen. The speck is the plane. If he sees a tree ahead, he can turn his plane to the left and the speck moves to the left. In this way the pilot is able to see everything beneath him.

Cops Get Them Going and Coming

THE Police Department at Boston, Mass., is getting a new point of view. The cops there can now see both before and behind, with the new rear vision glasses that are being tried out. A pair of mirrored surfaces placed near the outer edges of the glasses and set at an angle do not interfere with the view straight ahead, yet they permit the officer also to look almost directly in back of him without the necessity of turning his head. No information is as yet available of any assistance which these glasses might give in describing an accident. We are inclined to believe that evidence of this character might not be admitted in court because the person observing the reflection in the mirror would see everything backward. The photograph shows Traffic Officer Fred Deady wearing a pair of the new rear vision goggles.

Speed Flash Gun

THIS is the latest development along lines of flash guns for photographers. The powder is carried in a cartridge that is sealed from wind and rain, enabling photographers to make photographs under all conditions. The camera trigger is released at the height of the flash by recoil of the reflector.

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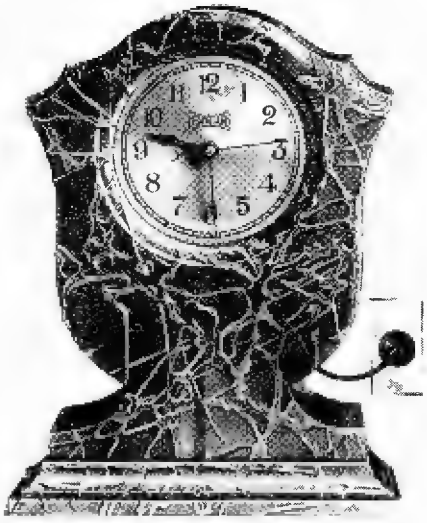
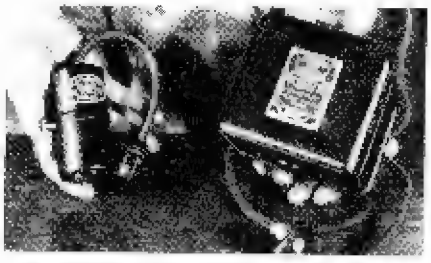
What's New *in* Radio



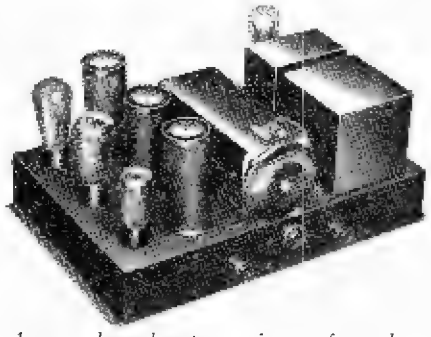
This clock plugs into your wall socket and operates directly from the house current.

YOU won't have to wind up the clock any more if you purchase this timepiece known as the Solar Clock and manufactured by the Aerial Insulator Company. It is designed for operation on 60-cycle, 110-volt alternating current, and is protected against voltage surge and frequency change. The manufacturer claims that it will keep accurate time and last a long time because of the quality of materials used in the clock mechanism and in the magnets contained within the case. Separate models may be obtained for direct current operation and alternating current of different frequencies.



To prevent electrical apparatus from interfering with radio reception, it is advisable to equip vacuum cleaners, etc., with these "filterettes."

EVERYONE knows that during the operation of vacuum cleaners, ultra-violet ray machines, and dentist's machinery, good reception on radio receivers is practically impossible. The Tobe Deutschmann Company has designed a number of choke-coil condenser arrangements, known as "filterettes," to obviate this disturbance. These instruments may be attached either to the radio receiver or to the machine causing the disturbance, though greatest efficiency is obtained when the latter procedure is used. In addition, this organization manufactures an interference locator and a series of "filterettes" to be used for counteracting the interference on high tension power lines and machinery such as X-Ray machines, dynamos, and generators.



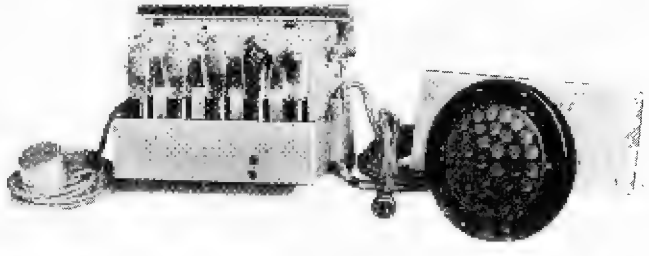
A new broadcast receiver of moderate cost and good performance.

THE Lafayette Pre-Selector, as the radio shown above is called, is the product of the Wholesale Radio Company. It employs three tuned stages of radio frequency amplification and a tuned detector stage. It uses three -24 tubes, one -27, two -45 tubes, and a 280 rectifier.

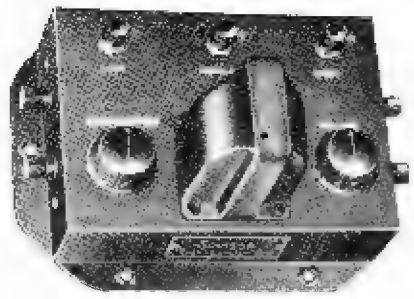
The old phonograph will reproduce through the audio stages of your radio when equipped with this phonograph pick-up.

AN old phonograph, mechanically good but tonally poor can be used with an electric phonograph pickup. If there is no phonograph jack on your receiver a special adapter may be used.

IN the April issue of SCIENCE AND INVENTION, in an article "Radio Rides the Roads," we told of several automobile receivers which might be installed within any car. A new set, manufactured by American Bosch Magneto Company, has made its bow since that time. The manufacturers claim that its design has sufficient amplification to overcome the "blanketing" effects of a steel automobile body.



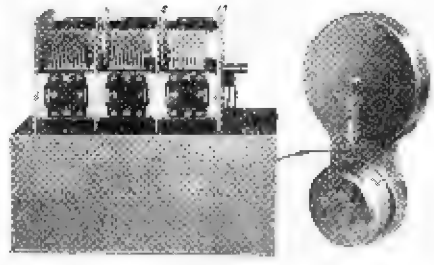
For the tourist and driver this auto radio receiver will provide programs to relieve tedious driving.



The Qualpensator enables you to cut out low, high, or middle frequencies on your radio receiver.

RECENT issues of well-known national weeklies have contained advertisements of a new radio receiver equipped with a "tone control." Contrary to popular belief this is no new or radical development. With the "Qualpensator" manufactured by the Samson Radio Company you can equip your radio with such a "tone control"—that is if you think you have a better ear for music than your scientifically designed audio transformers.

Such a device enables one to cut out the treble or bass notes through the loud speaker. This apparatus is attached to the audio end of the receiver and has no interfering effect on the radio frequency reception.



This Electronic remote control will prove a boon to the radio owner whose set is located some distance from his easy chair.

WHEN the long harangue of advertising *via* the radio irritates you, and you want to tune in a different station without getting out of the armchair, equip your set with the Electronic remote control manufactured by the Utah Radio Company. This remote tuning control may be attached to any set having ganged condensers. It will obviate the tedious process of walking from one room to another every time one wishes to listen to a new station.

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A City Under A Single Roof

By George R. Brown

Here is a Building with an Area of 21 Acres and 15,000 Population. It Uses 187,500 Gallons of Water and 20,000 Kilowatt Hours of Electrical Power Each Day

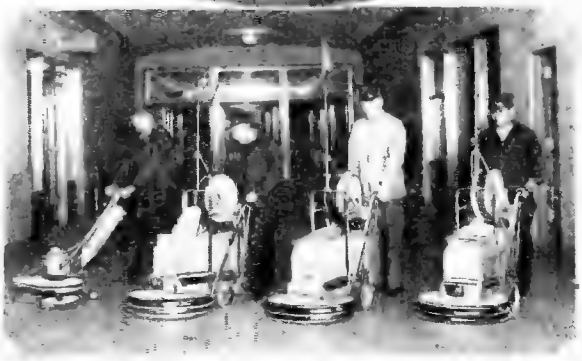
Above is a scene in the hospital of this miniature city. The terraced exterior of the New York Life building is shown at the extreme left.

An important link in the communications system of the municipality is the pneumatic tube room. The tubes carry inter-office communications.

If a fire should occur, the building's own fire department can plug in on standpipes installed on the terraced roofs.

ONCE the roar of the frenzied crowd blotted out the gasping breath of resin-covered, flat-eared, thick-necked pugilists swaying around a canvas-covered square. Once the dainty applause of Park Avenue debutantes filtered through a great arena as temperamental horses pranced before the judges' stand of fashionable horse shows. Once Stanford White, architect and creator of beautiful buildings, was shot to death by Harry K. Thaw, subject of screaming headlines. And it all took place in a slightly crumbling structure, modeled after the famous Giralda of Spain, and known to millions as Madison Square Garden.

Today, where once Madison Square Garden stood, the mighty gold-leaf, terra-cotta tower of the New York Life Insurance Company pushes its way through the early-morning Manhattan mists; and where the sporting and fashionable life once had its hilarious fling, a prosaic and work-a-day population toils in a thirty-four storied building reaching 617 feet above the ground. Within this huge and sturdy mass of brick and steel a veritable city is contained. It has its own police and fire department, health department, street-cleaning department, department of gas, electricity and water supply, and board of transportation. In this one building are also a bank, hospital, library, school, recreation center, newspaper, brokerage office, several restaurants, and shops catering to almost every need.



The power brushes of the street-cleaning department scrub the floors with the might of a hundred scrub-women.

The police force of 25 armed and uniformed men, is stationed in the lobby and main corridor during business hours. At night members of the force patrol the building, keeping in touch with their "precincts" by means of telegraph boxes similar to those on the (*Continued on page* 371)

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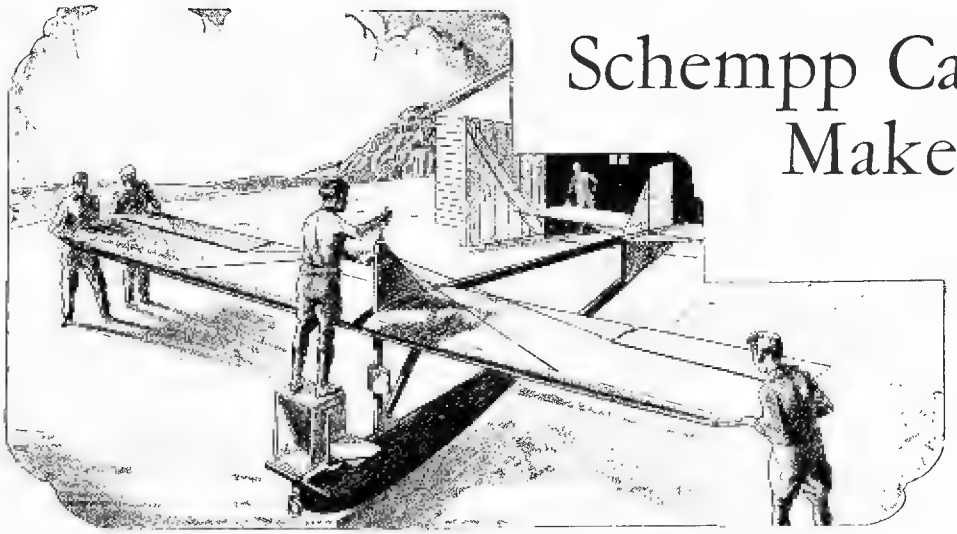


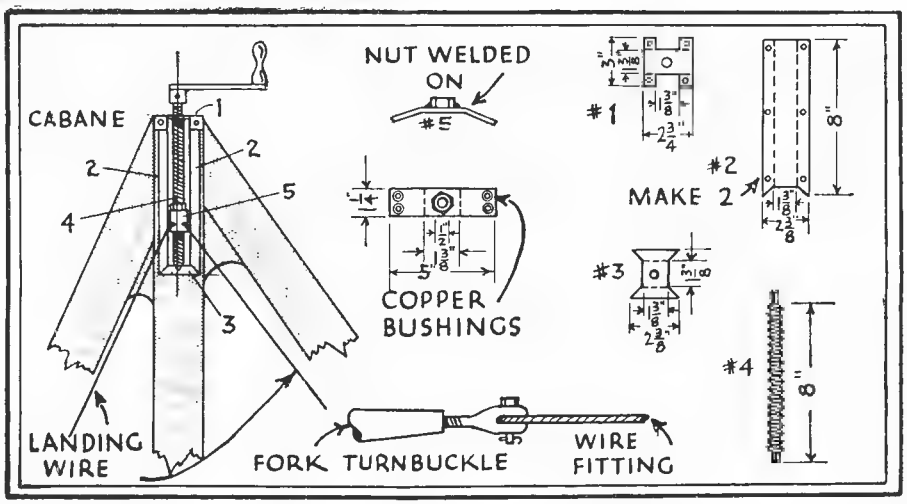
Schempp Cabane Spindle Makes Glider Assembly Easy

By Martin H. Schempp
Instructor, Syracuse Glider Club

NOT every glider club is so fortunate to have a real hangar out at its glider hill. Usually the glider must be housed in a barn or shed, the doors of which are seldom wide enough to let the assembled plane pass through. The wings and the tail section have to be taken off after each training session and must be put back on for the next.

Accuracy is required in assembling a glider. The bracing steel wires must be tightened, the turnbuckles safety-wired, and the bolts secured with cotterpins. All this takes time which might better be used in actual flying.

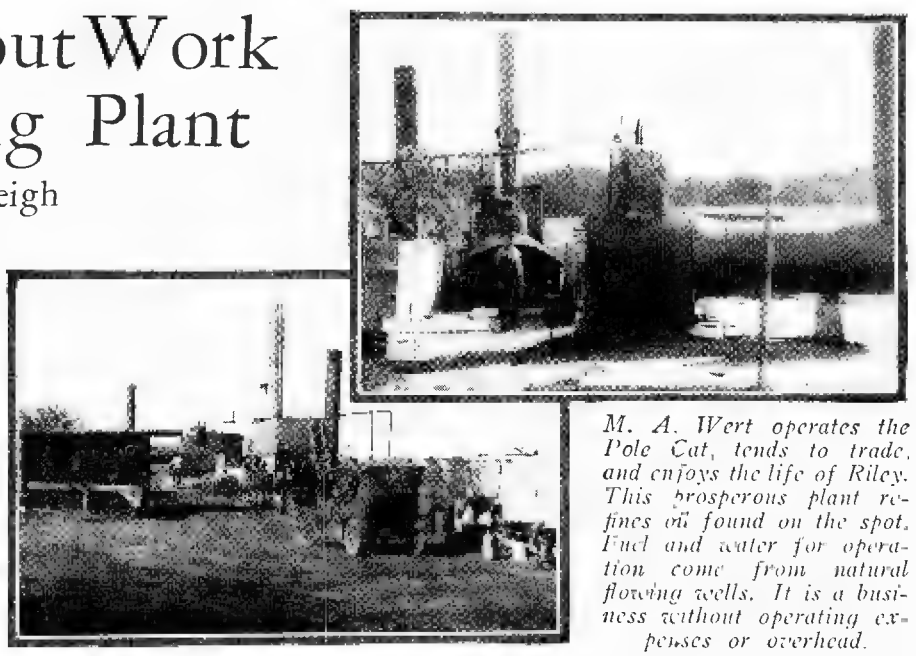
Here is a good hint on how to save time in attaching the wings and taking them off again. You will not have to take apart (*Continued on page* 372)



Wealth Without Work *at this* Refining Plant

By Walter Raleigh

Mother Nature Has Smiled Upon the Smallest Oil Refinery in the World . . . and Incidentally Upon Its Cheerful Owners



M. A. Wert operates the Pole Cat, tends to trade, and enjoys the life of Riley. This prosperous plant refines oil found on the spot. Fuel and water for operation come from natural flowing wells. It is a business without operating expenses or overhead.

OVERHEAD—significant of close figuring and apprehension in most industrial enterprises—doesn't mean a thing in the world to the Pole Cat Refinery, which is the smallest going concern in the world.

The Pole Cat is a crude-oil manufactory located a few miles east of Lawton, Oklahoma. It has neither operating expenses nor roof, and the existence of the two owners may be described as "the life of Riley."

The refinery is located in a spot made ideal by beneficent nature. The crude oil it refines is produced within a radius of two miles. A gas well 200 feet from the plant supplies sufficient fuel to keep it in constant operation without cost to its owners. A nearby artesian well forces water into its boiler. The output of the plant is sold on the spot to tourists, farmers, and Lawton business men.

M. A. Wert, half-owner, operates the plant, keeps its books, waits on the trade, acts as his own cook and finds time to be a philosopher. N. H. Stinnett, his partner, is purchasing agent.

Wert is senior partner. Five years ago, in broken health, he abandoned a bank cashier's desk to take over operation of the refinery. Today, despite his 60 years, his ruddy cheeks and sparkling eyes (*Continued on page* 372)

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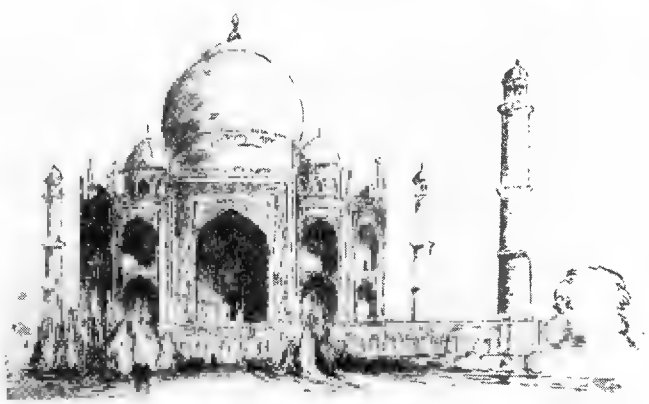
How About *an* Etching?

By Raymond Bancroft

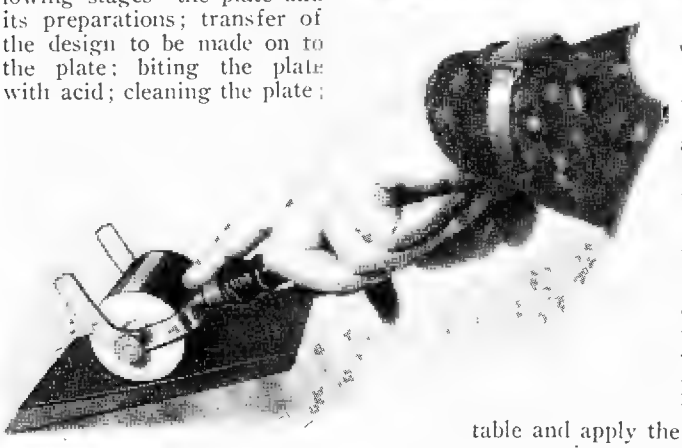
It Is Comparatively Inexpensive and Easy to Etch Designs for Postcards and Pictures, if You Follow These Directions

TO make an etching one should have certain materials, easily acquired from an artists' supply shop. These are copper, etching ground, acids, etchers' needles, rubber or glass trays, dabber or hand roller (similar to that used in print shops), hand vise, alcohol, turpentine and heating apparatus. For those unskilled in drawing, thin sheets of gelatine are required, and powdered red chalk.

The procedure to be followed is divided into the following stages—the plate and its preparations; transfer of the design to be made on to the plate; biting the plate with acid; cleaning the plate; inking and printing the design.



An ordinary darning needle placed in a holder will serve to trace the design on a transparent gelatine sheet.



After melting the wax upon your copper plate, move the hand roller over it to obtain an even ground.

Etching copper comes in sheets of varying thicknesses. It may be ordered in full size sheets and cut (any tinsmith will cut it) to the sizes one wishes, or it may be ordered already cut. All copper should be cleaned with alcohol, before grounding, with a soft rag or tissue paper, so that the plate surface will not be scratched.

The ground (the wax applied to the plate surface) may be bought or made. A good wax consists of one part gum mastic and two of white wax. The plate is held in the grip of a small hand vise over a small heating apparatus. Hold the ball of ground in one hand, so that it melts upon the copper plate. Still holding the plate by means of the vise over the heater, rub the wax gently to the edges of the plate and while warm place flat on a table and apply the roller so there is an even coating over the entire top surface of the copper. Care should be taken not to get the plate too hot and also not to miss any of the surface, which would be attacked by the acid. By holding the plate in the palm of the hand toward the light, any part not covered, even if no larger than a pin hole, will glint brightly.

After the ground has hardened (it takes a few hours) the rest of the plate should be painted with shellac, so that when placed in the bath, the sides and back will be immune from the action of the acid.

Any one not skilled in drawing wants to know how to put the picture on the plate. Suppose it is a photograph of your home that you want to transfer to the copper. Place a sheet of gelatine over the photo, fasten the gelatine down so that it does not slip, and then you are ready to trace. An ordinary darning needle will do, and may be worked easily if placed in a holder. Draw carefully over your outline with the needle, scratching the surface of the gelatine. When you have traced enough of the outline and detail to serve you as guiding lines on the plate, remove the tracing material and dust thoroughly with powdered red chalk. Remove the surplus chalk and you will notice the tracing you have made remains very clearly discernible. Place the gelatine sheet face down on the grounded surface of your plate and rub the back carefully with some blunt instrument. The entire outline and tracing will be transferred to the ground of the plate.

Now for the drawing upon the plate. Take a phonograph needle and place it in the end (*Continued on page 362*)

A small wooden stick (such as a match stick) inserted under the copper plate preparatory to its acid bath, eliminates the necessity of putting the fingers in acid to remove it afterwards.

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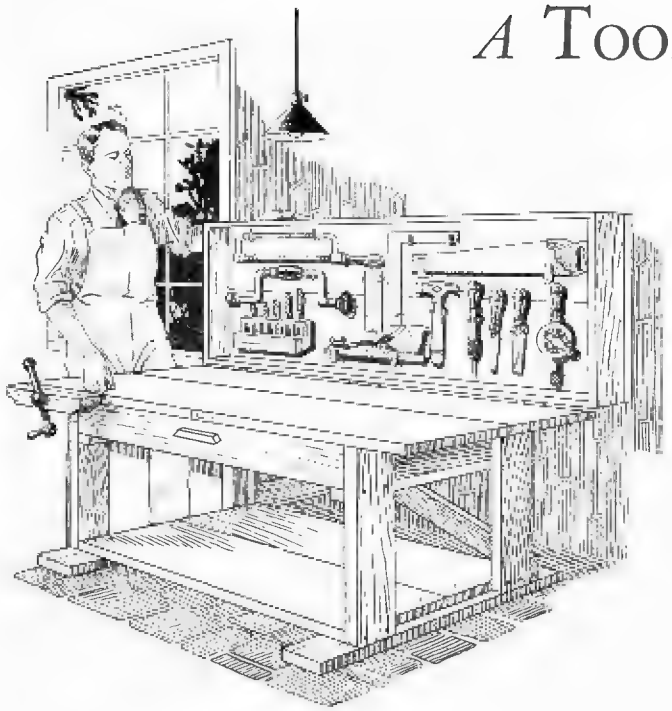
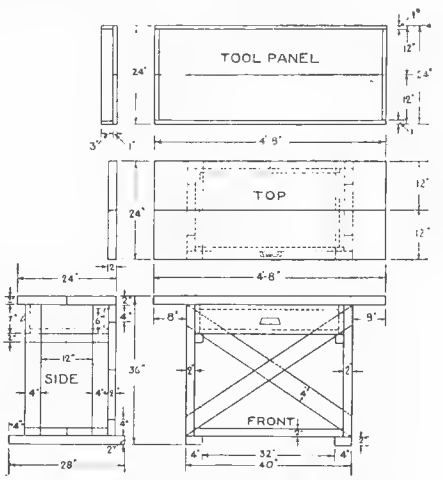
A Tool Box *and* Work Bench Combined

By Captain Edwin T. Hamilton



Some home carpenters keep their tools in a regulation box, but this often is not a success, as many keen-edged tools are ruined when kept in a box with heavier ones. At the same time, few enjoy hunting for a needed tool, which often has a way of being at the bottom of the box when needed most.



CAREFUL home carpenters will find the basement an ideal spot for doing things. However, tools are more often lost here than any other place about the house. Trades people, the gardener, the furnace man, coal carriers and ice men are constantly in and out. This means that tools must be locked up to guarantee them from being stolen, misplaced, or lost.

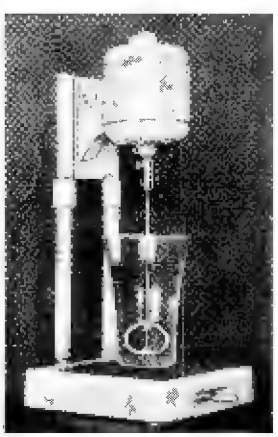
To overcome these objections, this bench, equipped with a tool box or panel, has been designed. Simple to construct and costing little, it nevertheless eliminates the worry of lost tools and dulled instruments. The tool box is hinged on the bench, which serves as a cover to the inverted box. The box may be locked with a single padlock.

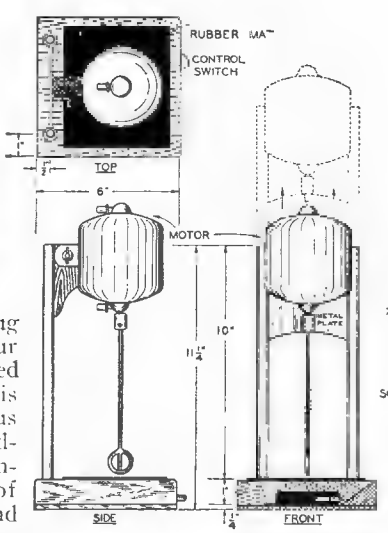
A generous drawer is allowed for the storage of smaller tools. It can be locked also by a padlock.

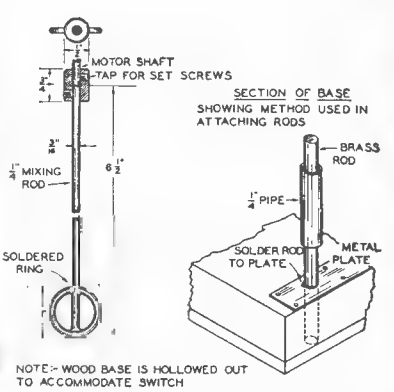
Use 2″×4″ white pine stock for the floor standards, legs, leg braces and the guide ways for the drawer. A 26′ length will do fine. Cut two pieces 28″ long; four pieces 32″ long; two pieces about 50″ long, which form the braces, and should (*Continued on page* 371)

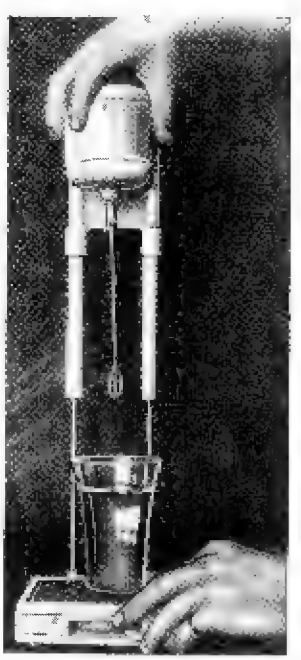
Make this Mixer for $1.50

By H. K. Francis









IF the boys at the drug store guy you over your propensity for malted milks, fool them. Make this mixer and sup your luscious drinks in the kitchen. In addition it will prove indispensable for the female part of the household. She will find it of much value in beating eggs, whipping cream, and mixing mayonnaise.

The writer built his at a cost of less than one dollar and a half. . . . The motor was obtained from an abandoned fan, and new brushes were provided from the carbons of a worn out flash light battery. The rheostat or speed control came with the motor.

The question of mounting the motor and making a mixing rod was a problem to be considered. The problem of raising the motor with the mixing rod was solved by placing vertical brass rods ¼ inch in diameter at the back of the base, and mounting the motor on sliding sleeves made of pieces of brass pipe. Holes were bored through the base, and the rods then were soldered to a metal plate nailed to the top of base. An alternate method is to thread the rods and secure them by nuts at the top and bottom of the base.

The motor having been mounted on a metal plate, which in turn was soldered to the sleeves, sufficient slack in the cord was provided between the switch and the motor, to permit its being raised. The whole job was given a coat of white enamel, and a small rubber mat was attached to the top side of the base. . . . The rod was constructed as shown in the illustration. It is quite likely that more than one rod will be desired for different uses. In such a case, a rod with two (*Continued on page* 360)

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A Collapsible Boat *from* Old Inner Tubes

By Dick Cole

The collapsible boat assumes this form when inflated. Full constructional details are shown at the bottom of the page.

DUCK hunters, fishing enthusiasts, or tourists visiting remote lakes and ponds have often found the need of a collapsible, compact boat which might be transported with little trouble. Here is the answer to the prayers of outdoor pleasure-seekers. It is a collapsible boat of the pontoon type, made from a couple of inner tubes and covered completely with canvas. It is easily constructed, and may be used in the shallowest pond or the deepest river.

The boat consists of a flat, oval-shaped bag made of canvas and waterproofed, within which is a large pneumatic tube made by joining together two discarded 6″ automobile tubes to form one large tube. Figures 1—2 show the canvas pieces that make up the carcass of the boat. The dimensions are given on the drawings. Figure 3 shows how the long strip is sewed to the top and the bottom piece. This seam should be sewed very strongly—preferably by machine. The carcass can not be completely closed up until after the inner tube is inserted.

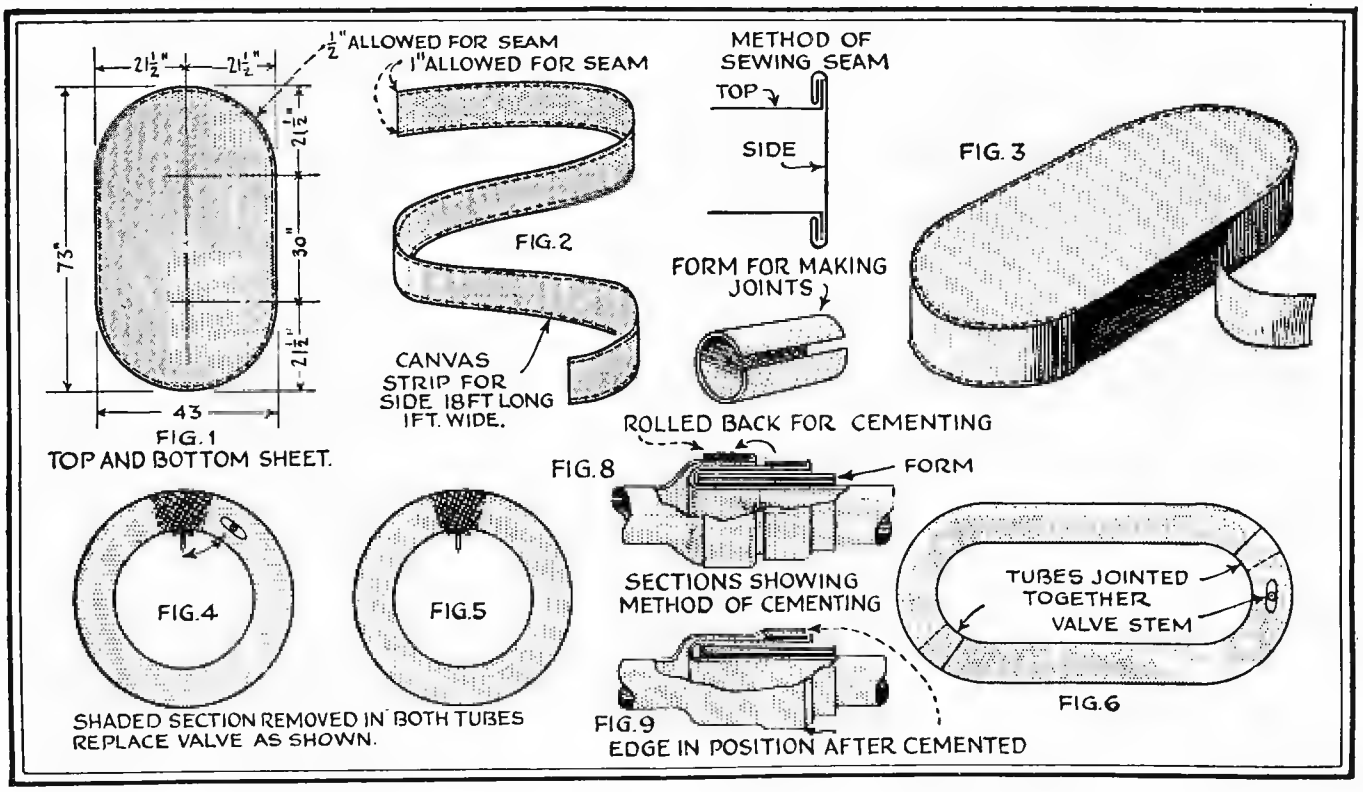
Two 6″ inner tubes approximately 32″ in diameter are used. New tubes are not essential—patched tubes of good, live rubber will serve as well. One valve stem only is required on the rebuilt tube, so the section of one tube is cut off and discarded. The valve of the other tube is removed and replaced in the side wall of the tube. See Figures 4 and 5. Figure 6 shows the two tubes joined together to form one big tube. Most inner tubes nowadays are of the "form fitting" variety—that is, they are molded to the shape of the tire casing, and in joining the two tubes, care should be taken that the ends are brought together so as to maintain the curvature. If a line is made with an indelible pencil along the valve stem line of each tube, this will serve as a gauge when the joints are made.

Vulcanizing Helps

IT is best to have the joints vulcanized. If it is done on an ordinary hot plate used for tube patching, the position of the joint must be changed three times to vulcanize the whole section, and this undue exposure to the heat will overcook the rubber. A cemented joint is preferable to the make-shift vulcanized joint.

However, a thoroughly secure cemented joint can be made by following the method shown in Figures 8—9. Figure 8 shows the sheet metal sleeves which are used as a form. Two of these are made to fit one within the other with the slots diametrically opposite. Any fairly stiff sheet metal can be used. The diameter should be the same as that of the tubes to be joined. The length is immaterial—about 10″ is convenient.

In making the joint, the end of one tube is drawn through the hollow cylinder and folded back over the outer surface, then folded back on itself for about 2″. The end of the other tube is stretched over the form at the opposite end, and it, (*Continued on page* 367)



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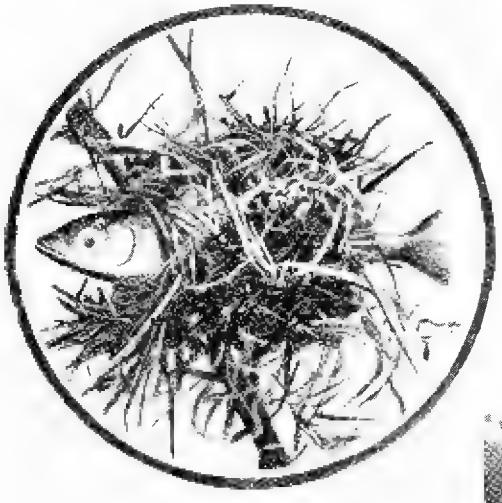
Would You Believe It?

The Cat, the Dog, and the Parrot–Not a Fairy Tale

IT is perfectly possible for animals with traditional animosity toward each other to be trained so that they are as friendly as a pair of turtle doves. Here a twinkling-eyed caniac holds a perch for a chanticleer, parrot, and dove. A cat has come to rest on the chanticleer and a bushy-tailed admirer is perched on the dog.

Like a Bird, This Fish Lays Eggs in Nest



HERE we have one of those mysteries of nature—a fish that constructs a nest from seaweed and driftwood. The nest is built around the stalk of an undersea plant and the fish uses it as a deposit for its eggs. After the eggs have been laid, the fish continues to hover around it and guard it against enemies. This fish, called the Epinoche, possesses the ability of changing its colors in accordance with surrounding structures.

A Spider's Web That Is Not Built by a Spider

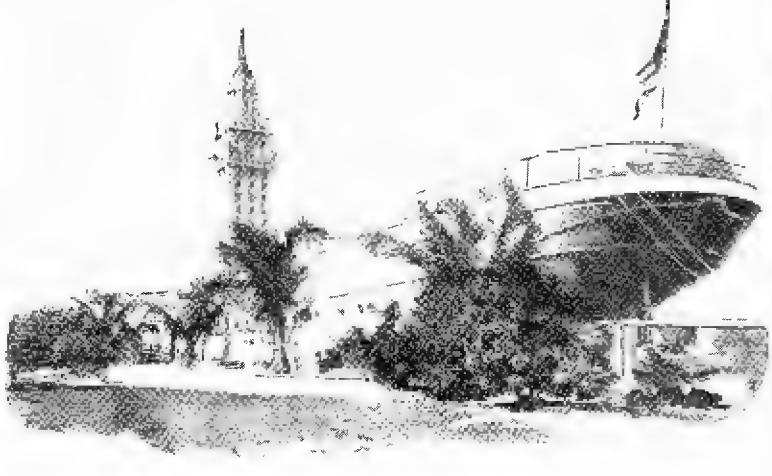
THIS looks like a spider's web, doesn't it? But it is not. The web itself is 40 feet high, and 60 feet wide, and it is used to decorate the lawn of a resident of Chicago. The web is stretched between two trees, and greatly enhances the effect an observer gets of the buildings and surrounding shrubbery.

The Earth Pillars of Europe

ONE of the strangest geological sights of Europe is the earth pillars located near Bozen, in northern Italy. The pillars were formed by glaciers and were further shaped by centuries of erosion. On his recent Alpine climb, Father Bernard J. Hubbard, geologist of the University of Santa Clara, California, took this photograph. Wouldn't you think either that the formation was artificial, or the photograph from another planet in our solar system?

Floating Aquarium

THIS boat was the former German yacht, Prins Valdemar, which is now being used as an aquarium in Miami, Florida. What appears to be its mast is in reality the Miami Daily News tower in the distance. Although one would think that the boat is located on land, it actually lolls on the surface of the water in an inlet of Biscayne Bay.



Volcanoes Being Harnessed to Heat Houses

A HOTEL is being constructed on the rim of the crater of Kilauea volcano in Hawaii, and this hotel will be heated by the steam of that volcano. At present the same steam supply is used to heat the Government House where Dr. T. A. Jaggar constantly makes observations of 'quakes and eruptions. The photograph shows spectators and travelers examining the steaming lava beds.

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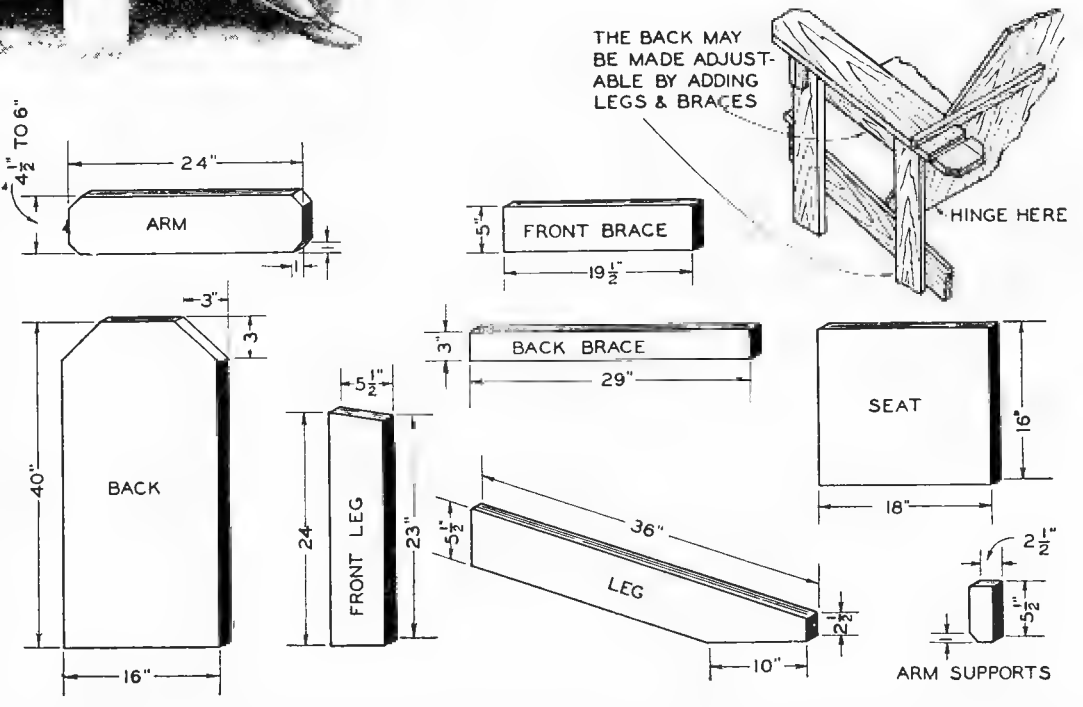
Be Comfortable—*in this* Garden Chair

By H. L. Weatherby

A Few Pieces of Wood, Household Tools, and Two Hours of Work Will Give You a Sturdy Chair for Summer Days



COMFORT has usually been the last thought in the construction of most garden and porch furniture. Many a pleasant summer night has been interrupted by the aches received from so-called rustic furniture. No longer need you endure this discomfort. You can construct the comfortable chair illustrated on this page.

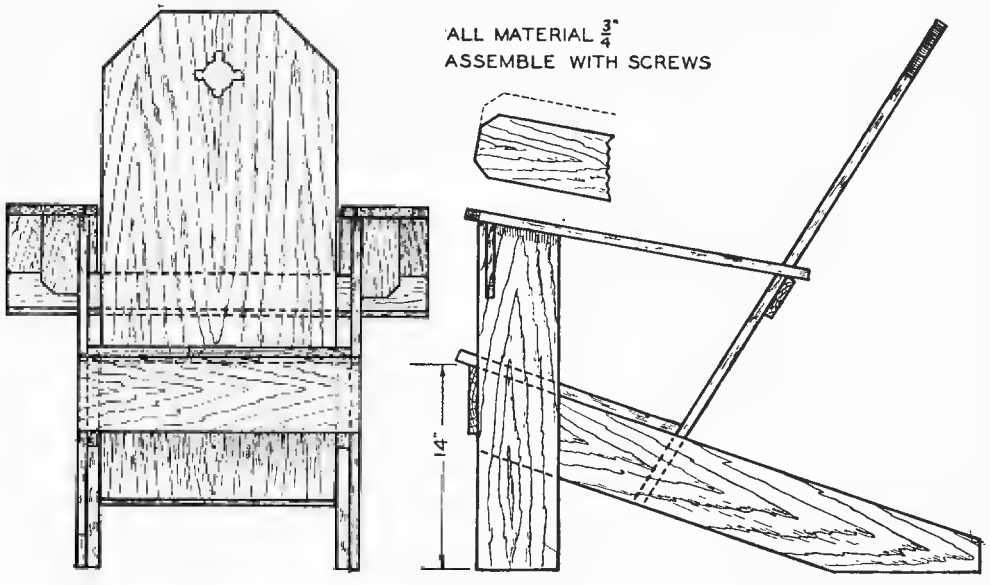
It is inexpensive—built out of common wood; it can be cut out, assembled, and made ready for use with two hours of work. It is sturdy and will withstand the weather—particularly when well covered with paint. It may be used simply as a lounging chair, or its wide arms will provide space for writing. And in addition, it may be constructed with ordinary hand tools found around the house.

The construction is so simple that very little space need be devoted to it. Detail drawings of all parts, with dimensions, are given. Before assembling any of the chair, each part should be cut to size and shape. The wide boards for the back and seat may be built up and fastened together with cleats on the under or back side. Better still, they may be glued. Of course, well-seasoned lumber should be used.

After carefully cutting the pieces and smoothing the edges, round off the sharp corners. Then assemble the various parts comprising the two sides. Flathead screws should be used for this. They should be well countersunk into the wood.

When the seat, arms, and back have been fastened in place, start the painting process. A primer coat followed by one or more coats of outside paint will preserve the wood and keep it from swelling and warping. Painting is an important item when glue has been used. The writer suggests the use of white, cream, gray, or green.

Glued joints may in some cases be reinforced with doweling or with finishing nails. Round headed screws with copper washers make a neater job than countersunk screws. Throw a cushion into its seat and it simply invites one to sit down. It is low enough so that one's feet rest comfortably on the ground.



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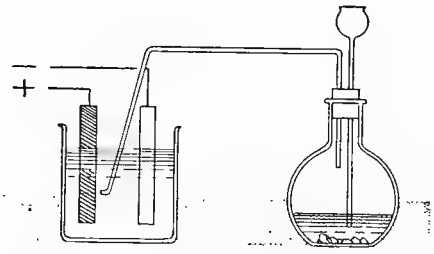
Produce Color *and* Light *by* Electrochemistry

By Eugene W. Blank

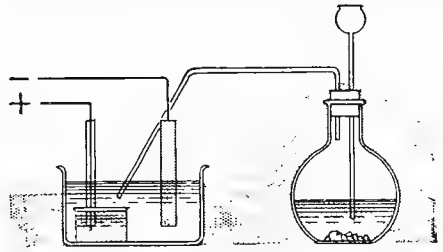


Here is the arrangement of apparatus for producing cadmium sulphide (yellow pigment), lead carbonate (white lead), and copper arsenite (Scheele's green) by electrochemistry.

THERE are many classic experiments in electrochemistry that the experimenter can easily perform and never fail to derive profitable amusement from doing so. A particularly fine electrolytic experiment is that of producing white lead from metallic lead electrodes. White lead is essentially basic lead carbonate and is the basis of many white paints. Two sheet-lead electrodes and a glass jar are used. The electrolyte consists of twelve grams of potassium chlorate and three grams of sodium carbonate dissolved in a liter of water. When a current is passed through the apparatus and carbon dioxide gas bubbles through the electrolyte, white lead will settle in heavy clouds from the anode. The yield is excellent and the lead carbonate may later be filtered off and dried if the experimenter so desires. This electrolytic process has been made continuous and has obtained commercial importance.

THERE is a unique attraction in the production of color pigments, luminescence and chemical elements by electrochemistry in the home laboratory. Other electrochemical experiments appeared in the July number of SCIENCE AND INVENTION.

Cadmium sulphide is a beautiful yellow pigment that can be produced electrolytically, in an apparatus similar to that used for the production of white lead. The anode is a bar of metallic cadmium, which can be procured from any chemical dealer. For the cathode a strip of platinum or a carbon rod is to be used. The electrodes are immersed in an electrolyte which consists of a saturated solution of common salt. Pass a current and at the same time bubble hydrogen sulphide gas through the electrolyte. Clouds of brilliant yellow cadmium sulphide will be precipitated.



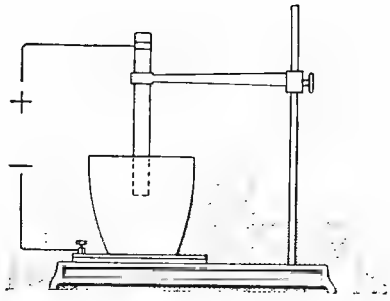
Mercury vermilion, a beautiful red pigment, is produced with this set-up.

For a red pigment we may prepare mercuric sulphide or vermilion. A dish of mercury acts as anode and a carbon rod as cathode. An iron wire extends into the mercury being protected from the electrolyte by a glass tube, that also extends down and dips into the mercury. The electrolyte consists of an eight percent solution of ammonium and sodium nitrates. A current is passed and hydrogen sulphide gas allowed to impinge on the mercury anode. Brilliant red clouds of vermilion will be produced.

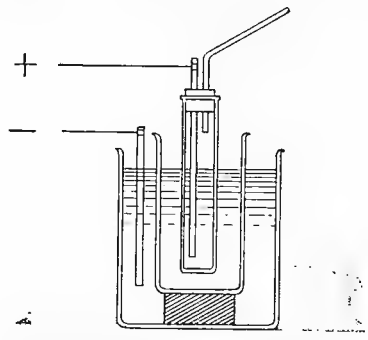
Scheele's green is copper arsenite and is a brilliant green powder. It may be produced in the cell previously used for the preparation of white lead. The electrolyte consists of ten grams of sodium sulphate dissolved in a liter of water. The electrodes may be cut from sheet-copper. Place the whole apparatus over a burner or on a water bath. Stir white arsenious oxide in the bath while the current is passing. Copper sulphate and sodium hydroxides are formed, the latter dissolves the arsenious oxide forming sodium arsenite. The sodium arsenite immediately reacts with the copper sulphate and copper arsenite separates as a green cloud. The sodium sulphate is reliberated and the operation may be continued until the copper electrodes are entirely consumed.

Calcium carbide is another electrochemical product of great commercial importance. At the present time probably half a million tons a year are consumed in the preparation of acetylene and of calcium cyanamide as a step in the synthesis of ammonia.

Commercially calcium carbide is made by the action of an excess of carbon, in the form of coke, on quicklime in an electric furnace at a high temperature. The process can be duplicated on a small scale by using a graphite crucible as the cathode and a carbon rod as the anode. A potential of sixty to 100 volts should be used in the experiment. The carbon anode is made to touch the bottom of the crucible and is then withdrawn so as to strike an arc. A mixture of 56 parts of quicklime and 36 parts of coke, by weight, is gradually added to the crucible after it has attained a high temperature. The product after cooling may be thrown into water, when acetylene gas will be liberated and may be ignited. Calcium carbide is a hard, brittle, crystalline solid that is usually bronze colored due to impurities.

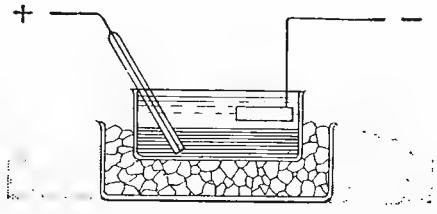


With this apparatus you can make calcium carbide, which combines with water to produce acetylene gas.



Common salt is electrolyzed in this cell to produce caustic soda and chlorine.

An extremely interesting experiment consists in the electrolysis of common salt. Sodium hydroxide, or caustic soda as it is commonly known, and chlorine are the resulting products. Essentially the apparatus consists of a large jar containing a porous or unglazed pot, or battery jar about which is wrapped a layer of nickel-wire gauze to act as the cathode of the cell. A lamp chimney surrounding a carbon rod serves as the anode. The electrolyte consists *(Continued on page 356)*



An evaporating dish containing potassium bromide and a layer of mercury, and a dish of crushed ice, form the basis of the electrochemical production of light.

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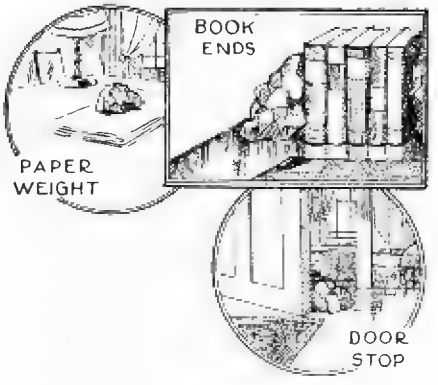
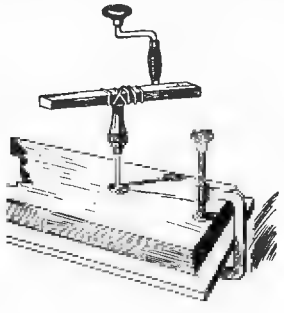
WRINKLES

First Prize, $5.00



Book Ends from Stones

STONES which are found in many artistic and unique shapes can be painted in bright colors and used for door stops, book ends, paperweights and other useful purposes.—*Earle Bennett.*



Easing Difficult Drilling

WHEN you find it necessary to bore a large hole through a thick piece of wood and your drill does not easily cut its way through the wood you will find the operation can be expedited by fastening a stick to the lower end of the brace stock, then calling upon someone to turn the brace while you bear heavily down upon it. In order to prevent the bit from breaking through it is a good idea to clamp a board under the block that is being drilled.—*Thomas MacGregor.*

Emergency Ink

CREPE paper soaked in a small amount of water and then squeezed out will result in ink that can be used in an emergency. If the ink is not dark

enough, soak another piece of the paper and repeat the process until you have the right shade. Different shades can be obtained by mixing colors as one does in water color. This ink is especially fine for tinting delicately.—*Earle Bennett.*

Paint Your Screens

I HAVE found painting screens with a shinola brush a great time saver over using the regular brush. One of these brushes can be made by tacking a piece of sheepskin or any nappy material on a block of wood 6 or 7 inches long. Have your can of paint or enamel handy, moisten the swab with it and just go up and down the screen. The mesh will not clog up. A small brush to get into the corners of the screens and to paint the frames is also good.—*Mrs. Lola Graybeal.*

Automobile Engine Gaskets from Ignition Wire

A VERY serviceable as well as substantial gasket can be made out of a piece of ignition wire. When the old gasket wears out, this may be easily remedied. Taking a piece of rubber insulated ignition wire and forming into the shape of a gasket, the little job is done.

The wire in this home-made gasket will hold firm, thereby making the gasket more substantial, and will last indefinitely.—*John B. Roswick.*

To Lubricate Car Windows

DID you ever notice how stubborn the glass windows of your car become in damp weather? A simple remedy is to be had by dropping a small amount of dry graphite between the glass and its felt channels on either side. —*Oscar Allred.*

$5.00

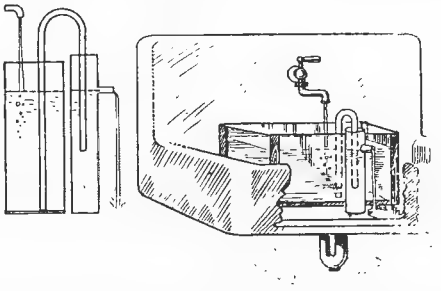
will be paid each month for the best wrinkle or recipe submitted to the editors and which they accept and publish in these columns. All other ideas accepted and published in this department will be paid for at regular rates. Address your ideas to—*Editor Wrinkles and Recipes.*

To Keep Pipes Clear

TRAPS, drains, sewers, pipes, and plumbing fixtures often become plugged, caused by articles being dropped or being thrown into them. A piece of braided cable with the ends twisted out to make a series of claws should be kept in every home so it will be at hand for removing any stoppage. This cable is used for guying telephone poles, and short pieces of it are often thrown away in alleys and vacant lots by linemen. Even a screen door spring is a handy thing to clean out the "gooseneck" in the kitchen sink.—*Mrs. H. E. Chrisman.*

Automatic Siphon for Aquarium

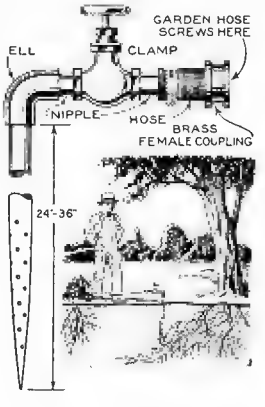
MANY people have difficulty in changing water in an aquarium because if the aquarium is allowed to overflow both fish and vegetation might be precipitated into the sink. With this arrangement water can be changed all day or whenever desired without removing the fish and the siphon starts and stops in accordance with the water level in the fish bowl itself. As will be observed, a simple metal container is constructed just as long as the tank is high. An overflow is drilled in the



side and a small spout is soldered thereto. A bent U tube is also provided as the diagram indicates. To start the siphon, fill the metal can with water, then fill the U tube and with the fingers over both openings invert the tube and see to it that the ends go into the aquarium and the metal container as the diagram shows.—*Joseph J. Bodmann.*

Root Waterer

IT is rather difficult to get water around the roots of a tree without making the soil or grass soggy. To make an efficient root waterer, simply take a piece of iron pipe 24 to 36 inches long, heat one end in a flame and hammer to a sharp point. Drill this full of holes, then fit upper threaded extremity with an ell and drive it into the ground 2 or 3 feet from the base of the tree. A valve may now be inserted, using a nipple at either end for the purpose of connecting one side with the ell and the other side with a small section of garden hose and a coupling. Use as illustrated.—*Raymond Wailes.*



A Good Waterer for Summer Use

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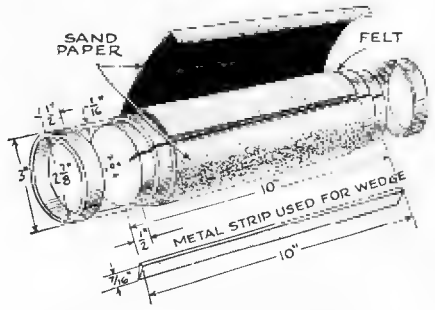
and RECIPES

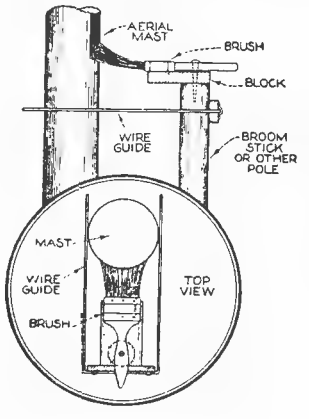
Drum Sander for Lathe

TURN a cylinder on the lathe, 10 inches long and 3 in diameter. Almost any kind of wood will do if without cracks. See that the spur center sets deeply into the wood so there will be no trouble in getting the cylinder centered again after it is once taken out of the lathe. After the cylinder is turned, turn a shoulder on each end 1/16 inch deep and ½ inch wide. Remove from lathe and with a rip saw cut a slot lengthwise of the cylinder about ½ inch deep. Take a piece of ordinary felt about 9 inches wide and 9⅜ inches long. Glue it around the cylinder, starting at one side of the slot and finishing at the other. Then cut a metal strip ten inches long and 7/16 inch wide to be used as a wedge to hold the sandpaper. This should just fit the cylinder by turning or folding over ½ inch of the ends and inserting them in the slot. The last thing to do is to make the retainer rings for the wedge. They should be a snug fit on the shoulders and can be made of 3-inch copper or brass tubing, or by cutting strips of metal you have around and soldering the ends together.—*Lyle H. Wilkinson.*



Aerial Mast Painter

IT is not always possible to take down an aerial mast for painting, or to climb up to do the job. Drawing shows how the painting is easily done. Upon a block attached to an old broomstick or other light pole a brush is fastened. A strong wire guide fitted on the stick a little farther down the pole keeps the brush from slipping from the mast.—*Arnold J. Jacobson.*



Home-Made Device Makes Painting Easy

The Quickest Way of Cleaning Aluminum

ALUMINUM should not be scraped with iron or steel wool. The aluminum is too soft and quickly wears away under such treatment. Discoloration of aluminum vessels is most quickly removed by using a chemical which will not injure the metal. This consists in making a solution, using nine parts of aluminum sulphate and one part of sodium carbonate to ½ pint of water. Use about 1 ounce of this solution for a small pot filled with water and bring the water to a boil. This will remove the most stubborn discoloration without injuring the aluminum vessel.—*H. B.*

Two New Contests

No. 1—$15.00 in Prizes for Home Workshop Photographs.

No. 2—$55.00 in Prizes for Photographs and Detail Drawings of Things You Can Make.

EVERY MONTH

Rules on Page 379

Patching Linoleum

CHOP up a cork into very fine pieces. Mix with enough glue to make a paste. Fill the hole with the mixture and allow to harden. Then smooth off the top with a sharp knife or file and paint the same color as the linoleum. Allow to dry before stepping on it.—*Lyndon K. Brady.*

Prevent Shoe Soles from Wearing Out Quickly

PAINTING the soles of shoes will preserve the leather very well. For old shoes put 3 coats of ordinary black finish paint, allowing each to dry for 48 hours. If the shoes are new, so that the finish on the soles is intact, roughen the surface with fine sandpaper before painting. Some of the paint will then be able to penetrate.—*Mrs. Dick Richard.*

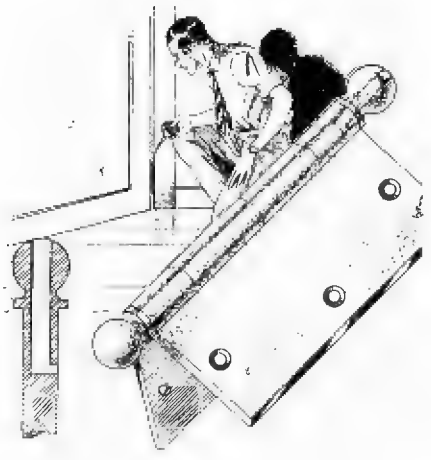
Cement for Steam Pipes

A SUITABLE cement for use on steam pipes is made in accordance with the following parts by weight:

Litharge ..... 2 parts
Powdered slaked lime ..... 1 part
Sand ..... 1 part

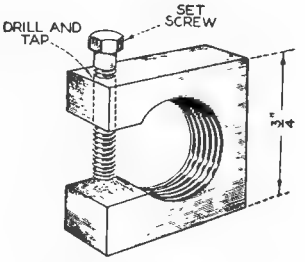
Mix the above ingredients together with a sufficient quantity of hot linseed oil to make a stiff paste, and use while warm.—*Dwight Lloyd.*

Self-Oiling Hinge Pin



IT is quite a problem to remove the squeak from some doors because of the difficulty encountered in getting the oil down in between the moving parts of the hinge without smearing or removing the pin. If you will drill a ⅛-inch hole down through the pin ¼ inch below the flange and a 1/16-inch hole through one side to meet it, the large hole will serve as a reservoir for the oil and the smaller one as outlet.—*Donald W. Clark.*

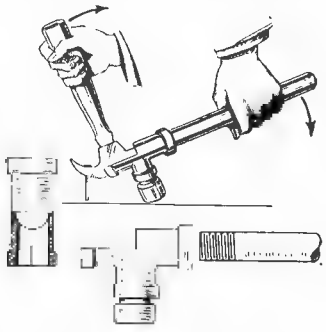
A Strong Small Clamp



TAKE a ¾-inch square nut and a suitable setscrew. Saw out one side of the nut, drill and tap to fit the setscrew. Particularly useful for model makers.—*Herbert Hawes.*

Hammer Attachment

THE task of pulling nails that are difficult to remove with an ordinary hammer becomes much easier if a simple attachment for the hammer is made



with a few pieces of fittings and a piece of pipe. A pipe-tee, large enough to fit the head of the hammer is cut away with a hacksaw. A nipple and cap are inserted into one end of the tee and a section of pipe is screwed into the other end. The contrivance is used as shown. —*R. E. Gay.*

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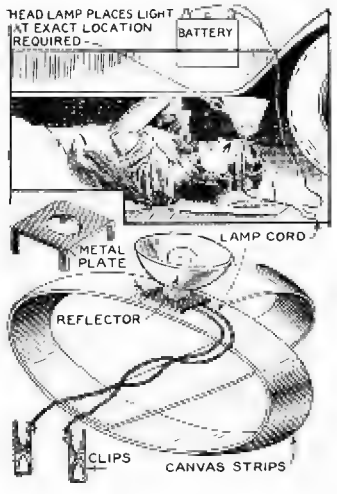
Your Car Needs Attention

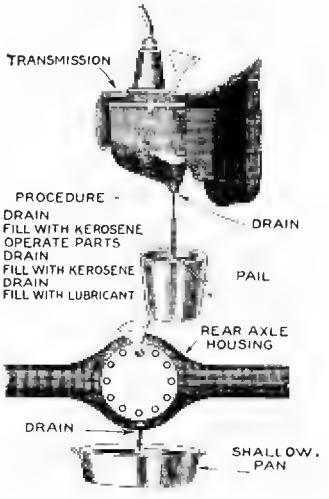
By George A. Luers

Some of the Most Careful Owners Neglect Certain Simple But Important Needs of Their Car. Here Are Five Excellent Ideas on the Care of Your Car by an Engineer Who "Knows His Stuff"

Clip Light Saves Trouble



OUR friend with an acute case of summer touring conceived a great idea—why not apply the doctors' head lamp to the job of working under the car? Here's what he did: He took a strip of canvas, a lamp socket, a reflector from a trouble light, a length of wire, and two snap-on clips. The canvas formed the head band, the socket fastened to a small piece of aluminum and this was clipped to the canvas. The reflector and wire completed the job.



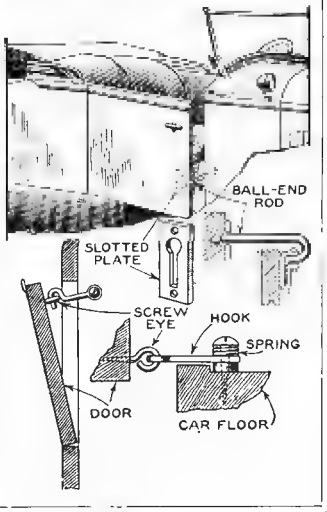
Save Your Transmission

ANY auto parts dealer will tell you that he sells more parts for transmission and rear axle than anything else. Wear and tear on these parts caused by crumbling gear teeth are responsible for the high sales. If you want to save some money, clean out your transmission and rear end with kerosene. First, however, drain off the grease. Jack up the car, pour in the kerosene, drive the wheels for five or ten minutes, and drain off the kerosene. Then fill the case with clean, fresh grease.

You Don't Need a Fan to Keep Cool

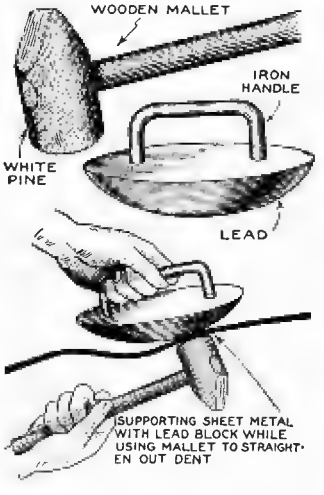
FRONT seat passengers come near to Hades in the summer, when the ventilation over this seat is practically nil. If you would overcome this discomfort try one or both of these ideas. The first consists of fasteners made from slotted plates and ball-ended holder rods. The plate is attached to the door; the rod is secured to the body. The other method consists of hooks and eyes. The hooks are secured with a spring and screw to the car floor. The spring keeps the hook from easily jarring out of the eyelet.

The idea is to keep the doors of the driver's compartment open a little. One door or both may be kept ajar according to conditions. It is all important that they should be securely held in position so that they cannot swing outwards, which might cause serious breakage or even accidents.



Cleaning Days are Here Again

A DIRTY motor is no better to look at than a dirty car. In addition it actually interferes with the efficient functioning of the engine. Dirt gathers oils and gasoline, making possible a dangerous fire when the carburetor pops back. To clean the car, take some waste, a brush, open pail, and some kerosene. One battery terminal should be removed before work is commenced. The kerosene is brushed on the engine at the top. As the dirt is loosened and brushed downward, the remaining kerosene is wiped off with waste. Use a deep pail with ample kerosene and most of the grit will settle down into the pail.


WOODEN MALLET
IRON HANDLE
WHITE PINE
LEAD
SUPPORTING SHEET METAL WITH LEAD BLOCK WHILE USING MALLET TO STRAIGHTEN OUT DENT

Dimples Removed Easily

IF YOUR car has a dimple in the fender or body, try this arrangement for filling out the original contour. Any simple dent may be pushed outward, using a bag of sand or roll of rags on the head of a jack. If it must be hammered out, use a wooden mallet and a block of lead. The lead may be melted, and while being cast in packed dirt, the iron handle inserted into it.

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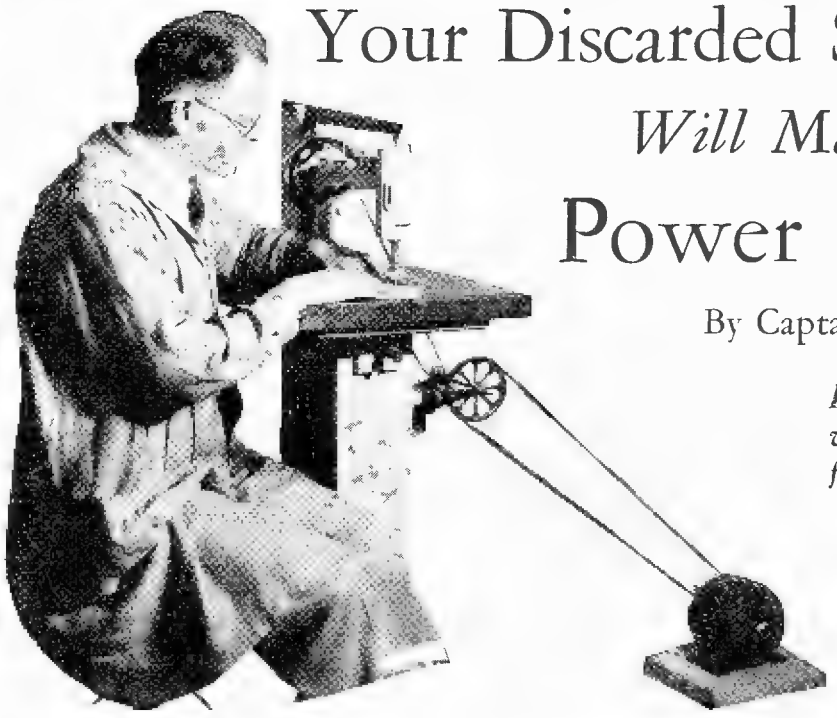
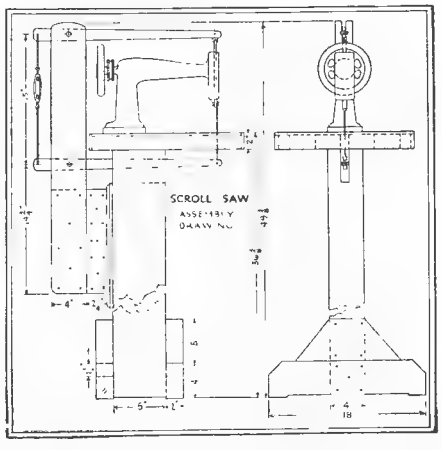
Your Discarded Sewing Machine *Will Make a* Power Scroll Saw

By Captain H. H. Baird

Practically Every Detail of This Serviceable Outfit Can Be Salvaged from Sources Available to Anyone

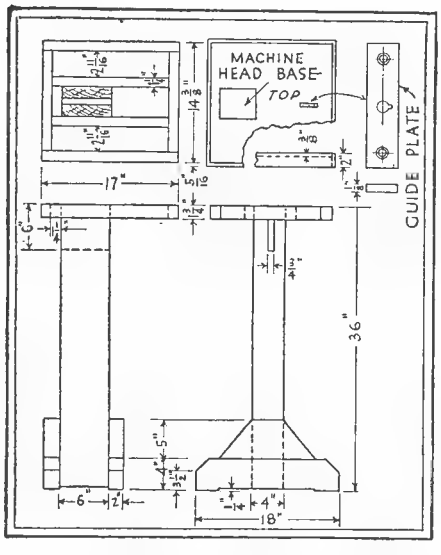




The photographs show the Baird scroll saw in action and a view from the motor side. The drawing at the left shows the guide plate and its relation to the table top. Above appears the assembly drawing of the outfit. Other drawings referred to will be found on the continuation page.

LAST winter I got an idea for a sturdy, accurate, and serviceable scroll saw. Here it is. I know it does good work because a local photographer is using it to cut out photograph profiles pasted to a wooden background.

Those who desire a perfect piece of workmanship may buy new material for this saw. Most of mine was salvaged: feet and post from a house mover, rocker arm bracket from a packing crate, and machine head from a local sewing machine dealer. I bought the oak for the rocker arms, the small hardware, veneer for the saw table, leather belt, and saws. Cost—about one dollar. The shaft and base for the step-down pulleys came out of an old phonograph. The pulleys out of an organ.



The whole base frame assembly is made of pine. The post may be made of boards and the hollow space filled with sand to give weight and reduce vibration—but I used a solid post salvaged from the beam of a dismantled barn. A section or groove ¾ inch by 6 inches is chiseled out of the upper end for the lower rocker arm, after which both ends should be squared. Next, finish the feet and braces to the dimension shown, spike them to the bottom of the post, and test for levelness on a true horizontal surface.

The saw table supports are now finished. Be careful to square the ends. Use soft pine. Attach the two central braces to the post with screws and glue. When these are trued up nail on the outside rail with long finishing nails—and glue all butt joints.

The table top should be made of ⅜" veneer to prevent warping, and should preferably be of hard wood. Fit all edges flush with the rails, but do not nail on until assembly of the machine head. The machine head base and guide plate will be discussed later.

Uprights for the rocker arm bracket are made from ¾" by 4" pine stock and are 31" long. Offset cleats are ¾" by 2¼" by 12", and are of same material. The center strip may be of any soft wood—which doesn't split easily—and is ½" thick. I used the end of an orange crate. Be sure that the grain of this strip runs across the grain of the uprights. Cover all surfaces with glue and either nail or clamp this center strip between the offset and upright strips. When glue is hard, plane and true the piece, finish the bracket base to dimensions shown, and glue this base to the rest of the bracket assembly, using 2" screws to draw it up.

While I used oak for the rocker arms, I believe birch would be preferable. Each arm is made of ⅜" stock, tapered as shown in the drawing. The groove in the small end of the upper arm is cut just wide enough to admit a tenpenny nail—or about ⅛". Construct the link from a nail as shown, and fit in this groove. Bore a hole for the supporting bolt ½" from the bottom edge of the arm. A 5/16" bolt with fine threads can be salvaged for this purpose from the sewing machine head.

Clamp the arms together, and bore holes for bracket bolts and turn-buckle wires.

An ordinary stove bolt may be slotted with a hack-saw for the lower saw blade holder—see sketch. Do not notch the lower (*Continued on page* 368)

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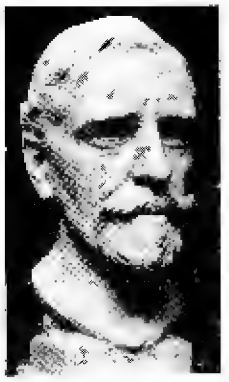
The way I see it—

By Murray Godwin

Augustus Post in Bronze



CHARLES ANDREW HAFNER, portrait sculptor of note, has taken a logical step in the recognition of Augustus Post as a man of practical imagination in aeronautics by modeling a characterful bust of him. The finished product, probably in bronze, will be on view at the Union League Club for a period. Mr. Hafner has done a fine job, we think, in bringing out the inner excellence of the man. Previously he had made sculptured portraits of such notables as Edwin Markham, the poet, and Thomas A. Edison, the inventor, and he has in prospect a portrait of Glenn H. Curtiss. He was well equipped, therefore, to perpetuate the features and character of Augustus Post. . . . Mr. Post himself is frankly pleased with Mr. Hafner's representation of him, but shows no signs of being willing to rest on his laurels and call it a day. He dropped in recently to tell us of his flight down the Hudson in a Condor transport ship, with Mr. Curtiss and a group of aerial pioneers, on the twentieth anniversary of the Curtiss flight from Albany to New York. Mr. Post's inclusion in the party aboard the Condor was no accident, for our aviation editor was intimately involved in the history-making flight made by Mr. Curtiss twenty years ago. He recalled that the special train that paced Mr. Curtiss to New York was the only one ever to have the right-of-way over the line except the one which transported the body of President Grant. . . . Early in September, Mr. Post said, he and Alan R. Hawley are putting on an anniversary party of their own. The two of them are going to fly, paddle, and tramp their way into the Quebec wilderness until they reach the point where they landed after a record balloon flight, made, like the Curtiss trip, in 1910. The place in question had neither name nor inhabitants. . . . The flight began in St. Louis and the distance traveled by the two intrepid aeronauts (1,172 miles) has never been equaled by anyone in a similar aerial vehicle. Having landed at their nameless destination in the wilderness, Messrs. Post and Hawley wandered about for ten days before reaching an inhabited part of the world. Now, rich in years and youth, they are celebrating by returning for a look at the landing place, pausing to fish for salmon by the way. As far as Mr. Post knows, their destination is as devoid of inhabitants or exact geographical designation now as it was when they alighted there. We have hopes of offering our readers some interesting notes on Mr. Post's summer diversions when he returns. And he has promised us a wonderfully interesting narrative, growing out of the Curtiss anniversary flight, for September.

Well—and What of It?

MLLE. LENA BERNSTEIN has proved her endurance by flying in an airplane continuously for more than thirty hours. So now we know she can last longer than Elinor Smith, who in April of last year remained aloft for twenty-six hours and something at Roosevelt Field. Neither of these women, however, has reached the mark set by Shipwreck Kelly. This may be due to difference in sex. Then again it may be due to diet. We don't know. . . . The point we want to make, though, is that we are through, all through, exclaiming over the ability of *anyone* to stay awake and hang on, whether he (she) hangs on to a flagpole or a stick. . . . There may be some object, relevant to aeronautic progress, in testing the staying powers of a plane and an engine by continuous flight. But the solo endurance flight tests nothing but the pilot, who can't be duplicated, and whose qualities can't be accurately transferred or transmitted for general utilization.

Duty Before Pleasure

ALCOHOLIC beverages in France seem fairly safe from political interference, because of the importance of the wine crop to the nation. Certainly it would take an enthusiasm and a capacity for evangelism as yet undisplayed on earth to wangle the French peasantry into planting its patiently evolved vineyards with commodities more prosaic and vastly less in demand. . . . We doubt, in fact, that all the threats and entreaties of the anti-alcoholics would suffice even to wean the glowering Normans from their *calvados*, which, under the name of applejack, survives lustily beneath uncounted stone piles on Jersey farms (legend has it that it is ready for dispensing when it upsets the stones and rolls to the cellar under its own power). . . . But we were saying—governments are unendingly enterprising, and the French Government is no exception. Coffee does not grow successfully in France. Therefore the government has decided that France shall drink chicory, which can be raised on French soil. By the device of a high duty on coffee, it has made that commodity too expensive for many Frenchmen to use. . . . Will the result be a corresponding increase in chicory consumption? Perhaps—but if the duty is high enough to warrant it, the result may be an increase in smuggling and its attendant activities. Within the next few years we may hear of a widespread coffee "racket" being built up in France. And the moral of this, if any, is that substitutes should be scientifically arrived at.

A Zoom at the Moon

ONE of the curious movements of this century is that which aims at actual personal investigation by earth-born creatures of the other planets in our solar system. Other times have seen tales, sometimes satirical, on the subject; but in our time an organization for the development of interplanetary communication is being formed and financed in all seriousness. Taking the experiments of Professor Robert Goddard and other contemporary rocket builders as a basis, this group is busying itself intensively with perfecting a means of voyaging to the moon. . . . Probably nothing nearer the bull's-eye of Pure Science has ever been undertaken by men. No profit-taking in any way proportionate to the expense and danger of the project seems even remotely possible. It is all labor and pains, sweat of body and brain, with almost certain martyrdom—for those who attempt the actual trip—as the price of success. In return will be realized, it may be, some further knowledge of the space beyond the earth's atmosphere and the satisfaction of having extended the travel-range of man, however precariously, to a point outside the limits of his place in the universe.

Burning Things Together

THEY'RE welding steel structures and flooring and ships now. What they'll be welding tomorrow and the day after we won't attempt to say. The pleasant peck of the rivet-hammer is still heard, of course, where new buildings are being erected, but the art of burning steel members together is making progress in the building field nevertheless. . . . It is an interesting fact that this process fundamentally differs not at all from that which the village blacksmith employed to join metal parts. All that is different is the apparatus and the source of heat. These, however, because they make it possible to take the equipment to the job and apply it to surfaces of any form and in any position, make all the difference in the world.

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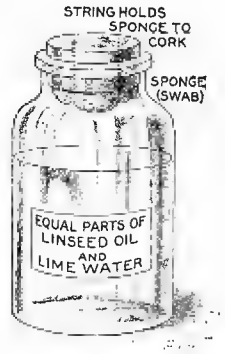


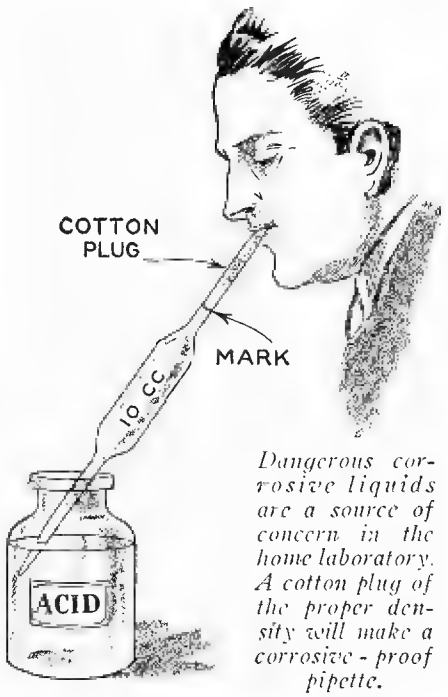
Applicator Bottle for Burns

A MIXTURE of linseed oil and lime water is a very good lotion for burns. The pain is eased by the lime water and the oil excludes air from the injured spot.

A handy applicator bottle is made by taking a wide mouth bottle and affixing a piece of sponge or soft cotton wadding to the under side of the cork. In use, the bottle is shaken to emulsify the lime water and oil, the stopper is removed, and the lotion is applied by means of the sponge or cotton, the cork serving as a handle. Of course, the sponge becomes moistened with the emulsion in shaking.

Six Handy Kinks *for the* Home Chemist

By Raymond B. Wailes



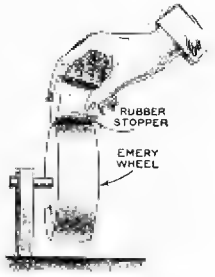
Dangerous corrosive liquids are a source of concern in the home laboratory. A cotton plug of the proper density will make a corrosive-proof pipette.

Protection Against Corrosive

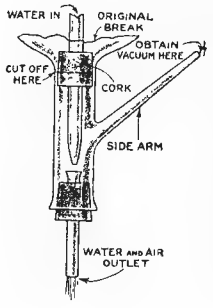
IN sucking measured amounts of corrosive liquids from a container by means of a pipette, a small wad of absorbent cotton inserted in the upper portion of the pipette will tend to prevent the liquid from being drawn into the mouth. Although permitting air to pass, the plug of cotton, when wet, will halt liquids, if the proper amount is inserted.

Fitting Rubber Stoppers

RUBBER stoppers are expensive. They may not be available in odd sizes for particular purposes, but large-sized rubber stoppers can be evenly decreased in diameter by grinding them down on an emery wheel. This procedure will always insure a good fit, which is not had if the stopper is cut down to size with a knife or razor blade.



Don't throw away that broken distilling flask. Cut away the jagged part and make a suction device of the remainder by following directions given here.



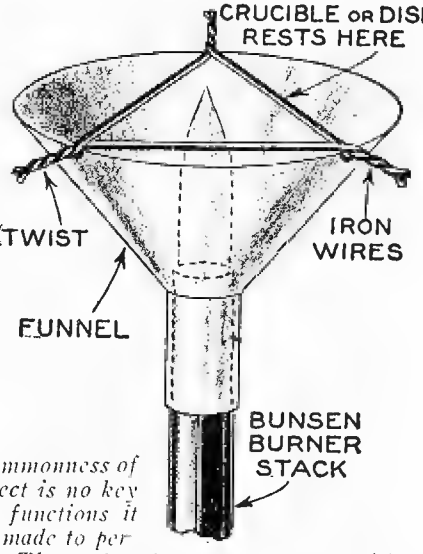
Vacuum Device from Broken Distilling Flask

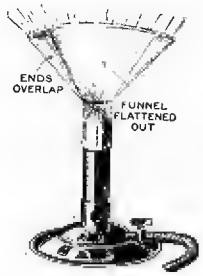
DISTILLING flasks will break. A good suction or vacuum device can be made from the neck of a broken flask with its attached side arms. The neck is fitted with two stoppers through which glass tubes pass. One tube is drawn down in diameter and leads water into the other tube which may be flared at the end to receive the water stream. The side tube of the neck acts as a connection tube and the "suction" is obtained from this tube. The broken portion of the distilling flask—the bulb or flask proper—can be removed by heating small portions red hot and pulling them away with a pair of old forceps. In this manner the edge will be fire polished. It can also be cut off from the neck of the flask. The lower or discharge tube should be small enough to cause proper operation. If it is made too small, however, the water will back up into the side arm of the flask. A little experimenting will indicate the proper dimension.

Funnels for Special Purposes

GLASS tubing is best bent by heating over a broad Bunsen flame. A broad flame can be had by fitting a small-sized metal funnel, flattened as shown, over the stack of the Bunsen burner. The funnel is flattened with a hammer. It might be necessary to bend in the ends to secure a better distributed flame.

A funnel can also be used to support porcelain crucibles and evaporating dishes for heating. The funnel is fitted over the burner stack. A triangle of wire, preferably of nichrome or other high-melting-point metal, is laid on the funnel. The triangle supports the vessel to be heated. Notches can be cut in the funnel to hold the triangle securely in place. The wire can be protected with pipe stems in the usual way.





The commonness of an object is no key to the functions it can be made to perform. These drawings show how, with a little ingenuity, the ordinary funnel can be utilized for two laboratory operations that are of frequent occurrence, namely, bending a glass tube and heating a crucible.

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Flashes *from the* Radio Lab

THERE still are many radio receivers in operation which have single tubes in the last audio stage. It has been found that by placing two power tubes in parallel, much distortion is obviated. We suggest that one construct this home-made "Tubadapta," instead of purchasing a similar manufactured product. It has the advantage of flexibility; so that the two tubes used on the wooden base may be placed in the set wherever there is room. The complete outfit consists of two sockets, an old tube base, and a suitable block of wood. As shown in Figure 1, the tube sockets are wired in parallel and connected to the pronged base which is plugged in to the regular connections for the last audio stage.—*Samuel Podell.*

THERE are very many uses for the extension cord connector shown in Figure 2. Many times the radio receiver is some distance from the place where the speaker is to be situated. This cord connector may be easily made by taking an ordinary house plug (the one on the electric iron will do nicely) and connecting it as shown in the diagram. Just insert the tips of the cords in the slots. They fit in nicely and make good contact. I have used this to much advantage in connection with my own receiver.—*Joseph Nagen.*

IN THIS DAY of the A. C. operated radio receiver, there is quite a demand for a simple device to control the line voltage of the set. Such an instrument is necessary to prevent the overloading of tubes. The device shown in Figure 3 is both inexpensive and efficient. The materials needed are an A. C. voltmeter having a scale of 0-150, a good heavy duty variable resistance of the carbon compression type, a wall receptacle, a light plug, several feet of twisted lamp wire, some wood, 110-volt switch, and a piece of bakelite.

Simply mount the parts on the panel and connect them as shown in the drawing. To connect it to the set, remove the plug of the receiver from the wall socket, and plug it into the receptacle on the unit. Insert the plug of the unit into the wall socket, turn the variable resistance to its lowest voltage, and turn on the set. Snap the switch into the "on" position. This will cut the voltmeter into the circuit; then turn the knob on the resistance until the voltmeter shows exactly 110.—*R. J. Stone.*

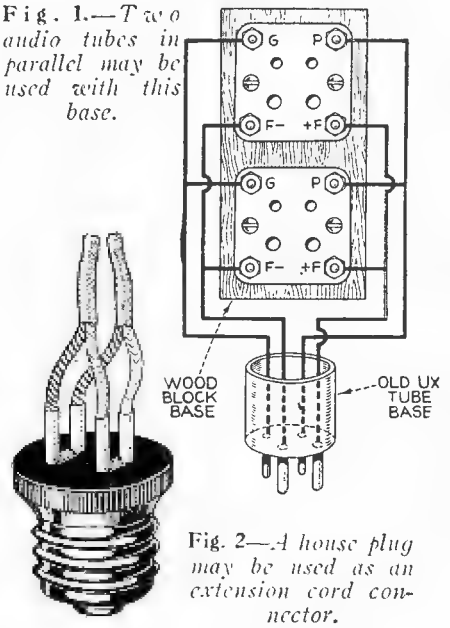

Fig. 1.—*Two audio tubes in parallel may be used with this base.*

Fig. 2—*A house plug may be used as an extension cord connector.*

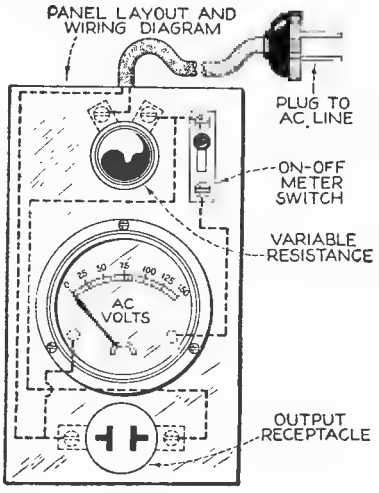

Fig. 3—*A voltmeter and variable resistance may be used as a good voltage control.*

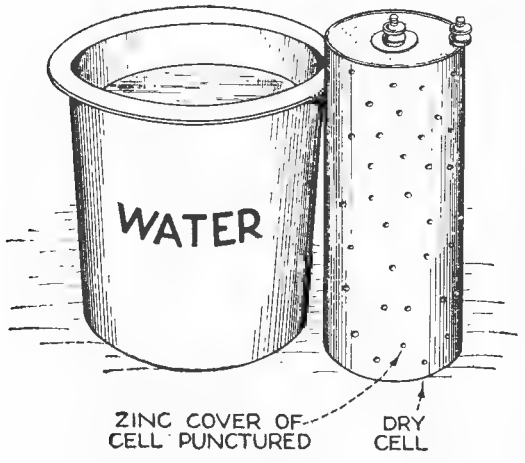

Fig. 4—*Vinegar and water will revive a worn-out dry battery.*

THE OWNERS of battery-operated sets will find that, although their dry batteries are not completely exhausted, their efficiency is seriously impaired before the point of saturation is reached. If one takes the ordinary dry cell and removes the cardboard cover, punching holes in the zinc case, and then immersing the battery in a solution of vinegar, water and salammoniac, as shown in Figure 4, he will find that the usefulness of the battery is extended. The writer has found that the life of the battery is increased twice the ordinary period. However, it is not well to use this method extensively, as it may cause considerable extraneous noise, interfering with reception.—*Harold Lotz.*

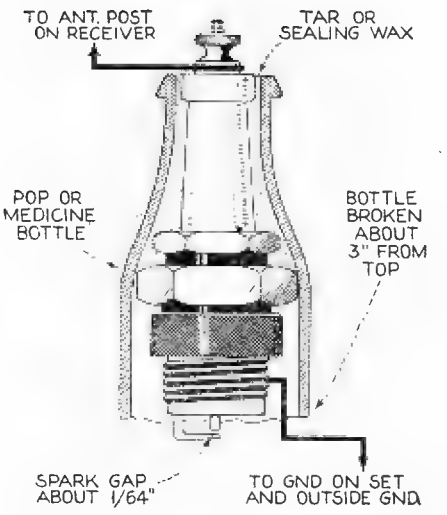
TO ANT. POST ON RECEIVER
TAR OR SEALING WAX
POP OR MEDICINE BOTTLE
BOTTLE BROKEN ABOUT 3" FROM TOP
SPARK GAP ABOUT 1/64"
TO GND ON SET AND OUTSIDE GND

Fig. 5—*A pop bottle will make an inexpensive lightning arrester.*

IN SPITE of the fact that many articles have been written to the effect that lightning has no damaging effect on radio receivers, one always feels a trifle safer when his set is protected by an arrester. Here is a lightning arrester which the author made at a very inexpensive cost. It consists of a top of a soda pop bottle, an old spark-plug, and some tar or sealing wax. The neck of the bottle is broken off, the spark-plug inserted in it, and the space filled in with tar or sealing wax, as shown in Figure 5. The top of the plug is attached to the antenna of the receiver, and the bottom portion to the ground on the set and outside ground. —*Eugene Badger.*

This is the page of the radio fan. If you have any novel ideas or practical hints which you have found of value in your radio work, send them to the Radio Editor. Regular space rates will be paid for all material accepted and published.

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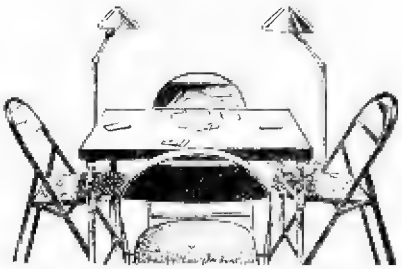
Scientific Aids *to* Comfort

By Mary Jacobs

Refrigerator and Range in One

FOR the benefit of those with kitchenettes, here's a new electric range and refrigerator combined. Heat for cooking and cold for refrigeration from a single electric outlet! To provide proper functioning, the manufacturers have put three inches of special insulation between the range and ice-box beneath it. The overall dimensions of the combination are 55¼ inches high, 26½ wide and 23 deep.

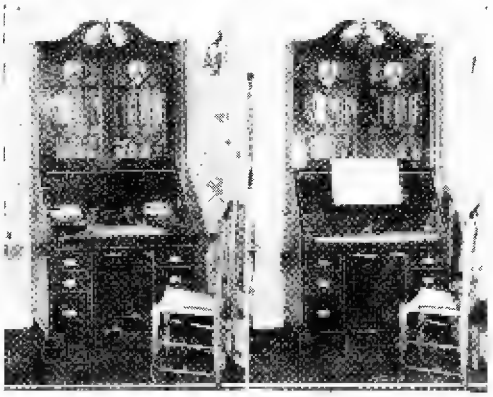
A Grand Slam in Illumination



IF you've ever played bridge at night and not had sufficient light from the lamp, you'll appreciate these twin lamps. Or if you've been in the shadow of the light and blamed your poor playing on its glare, just buy this set. These lights operate from the same outlet and are reputed to provide shadowless, glareless light, shielding the players' eyes. They slide into brackets that you attach to the legs of any standard-sized table. The brackets remain on when the table is folded.

Electric Hot Water Heater

NEED a hot water heater? Get this new electric one that is thermostatically controlled and maintains constant temperature in the boiler. It is heated by a coil immersed in a vacuum tube of oil (this prevents burning out or exploding), and the thermal efficiency of heat radiation to the water is said to be more than 97 percent. As the boiler is insulated, very little fuel is wasted.



Secretary-Bookcase-Piano

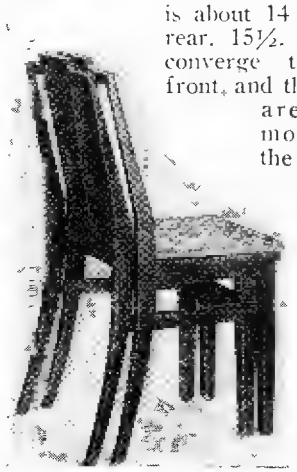
HERE'S a unique piece of furniture. It's a colonial secretary with the usual drawers and desk equipment, that has cases for books and can be opened into a piano.

The Latest in Pots

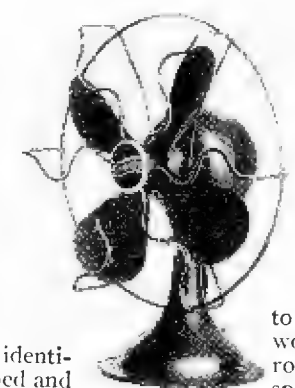
DID you know that the same material, rustless steel, which has been used for making buildings, is being used for kitchen equipment? You can buy your pots, frying pans, pitchers, oven dishes and knives made of this well known metal. It is bright, untarnishable, comparatively immune from acids, can be heated to a high temperature, and washes in soap and water.

Chairs That Nest

TIRED of using folding chairs that do not match your furniture? You can get rigid, non-holding ones that nest one in the other, in a good size. The front width of the seat is about 14 inches, the rear, 15½. The sides converge toward the front, and the rear legs are rigidly mounted on the seat frame, so that identically shaped and sized chairs can be accommodated. The seat has an open back; but upholstered arms, back and seat in any style desired can be included, according to the manufacturer.

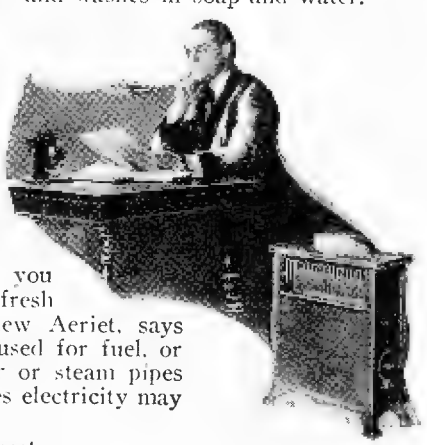


Portable Fan



YOU can put this eight-inch baby fan on a table or desk or adjust for wall mounting. . . It is light enough to be moved where and whenever you need it, to the hot kitchen, the workshop or the bedroom. The fan is single speed, controlled by an on-and-off switch in the base.

Make Your Own Weather



JUST as you turn on a light when you enter a room, you can switch on fresh air, warmth or coolness, with this new Aeriet, says the manufacturer. Electricity can be used for fuel, or a heat element connected to hot water or steam pipes can be substituted. The type which uses electricity may be had in portable form.

Names and Addresses of Manufacturers upon Request.

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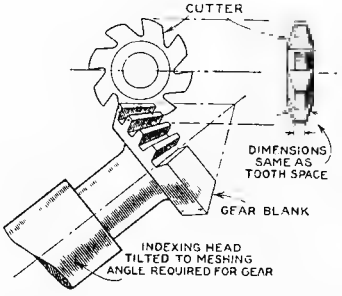
New Ideas *for the* Machine Shop

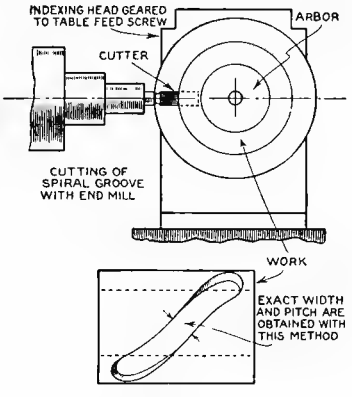
Milling Spur or Bevel Gears



TO cut teeth in a gear, the gear blank is mounted on an arbor and inserted in the indexing head spindle. The indexing head is tilted to that of the meshing angle of the gear blank. In the case of a spur gear, the blank is placed horizontal. The cutting tool is mounted on the spindle, the tool selected being of the approximate size of the space between the gear teeth. In case of the bevel gear, the tool may be the exact size for the large diameter, but to make the teeth approximately right, the depth of cut is made less on the small diameter. With the divisions of the indexing head, the required number of teeth are obtained. By offsetting the gear blank from the center of the cutter, variations in form of teeth are obtained, to make the teeth correct. Two or more cuts should be taken through each tooth space.

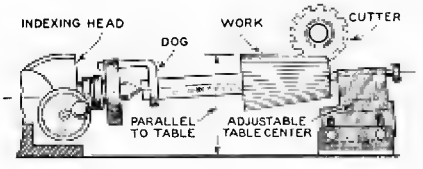
Cutting Accurate Spiral Grooves

THE work of accurately cutting a spiral groove, both sides parallel and of uniform pitch, is accomplished with the set-up shown. The end mill is used in cutting the grooves. The work is


INDEXING HEAD GEARED TO TABLE FEED SCREW
ARBOR
CUTTER
CUTTING OF SPIRAL GROOVE WITH END MILL
WORK
EXACT WIDTH AND PITCH ARE OBTAINED WITH THIS METHOD

secured in the index head and the table feed is geared to the head. Thus as the table feed advances the work, the index head is also rotating, and with proper gearing to the index head the exact angle of spiral is made in the work. The sides of the groove will be parallel, if a milling tool of the exact required width is used.

The average individual who has a machine lathe will have but little difficulty in selecting the proper gears to produce any angle that may be desired in the complete spiral. Naturally, the size of the cutter will have some bearing on the pitch of a spiral if the spiral is to be complete, so that one groove will not overlap the other.

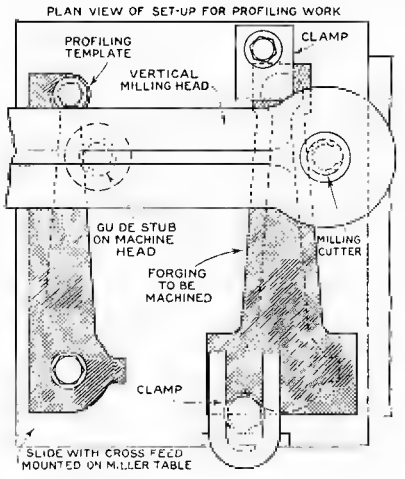


Fluting Straight or Tapered Work

WHERE a milling tool, reamer or similar job is to be machined with flutes, a set-up of the job, using the indexing head to obtain divisions of the diameter of the work is used. The indexing head center and a table center are used to support the work. A dog is used to attach the work to the face plate of the indexing head. The cutter is mounted on the spindle and the work is moved offside, until the working of cutting side of the flute is made correct. The clearance side of the flute, being unimportant, is neglected. Cutters for such work, can vary considerably in dimensions and form, without impairing the work.

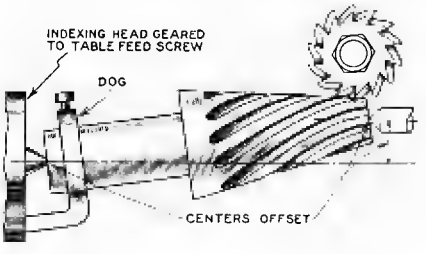
For Handiworkers

Home Workshop Enthusiasts Will Find Two Prize Contest Announcements of Much Interest to Them on Page 379 of This Issue



Profile Milling Work

THE simplest method of profiling is to use a machine with a vertical milling attachment or head. The work is then set up as shown. A profile template is made to represent one side of the job, if the work is symmetrical. A stub bar follows the template and the cutter cuts correspondingly around the forging. The work and template are mounted on a separate slide bed with cross feed. The combination of longitudinal and cross feeds is used for this profiling. The feeds are entirely operated by hand, the machinist keeping the stub or guide bar against the template



Milling Spiral Flutes

IN machining spiral flutes in either a straight or tapered reamer, the table feed screw is geared to the index head feed screw to obtain the compound feed. The work—i.e., the reamer, is mounted between centers, one in the index head and another on the table. A dog fixes the work to the index head. The sketch shows the work as set up for machining, in which a cutter is selected the approximate shape of the flute. As the work advances and also rotates while cutting, the flutes will not be of the same exact shape of the cutter, but will be wider and the side angles slightly different. This deviation is of no importance however in such a tool as a reamer.

It should be understood that in fixing the work between centers, the centers are offset. In spite of the fact that the spiral flutes of the reamer are not as accurate as those in a purchased product, the reamer can be used for substantially the same purposes. After the machinist has milled one or two of these reamers he is sure to make them in all sizes so as to complete his stock.

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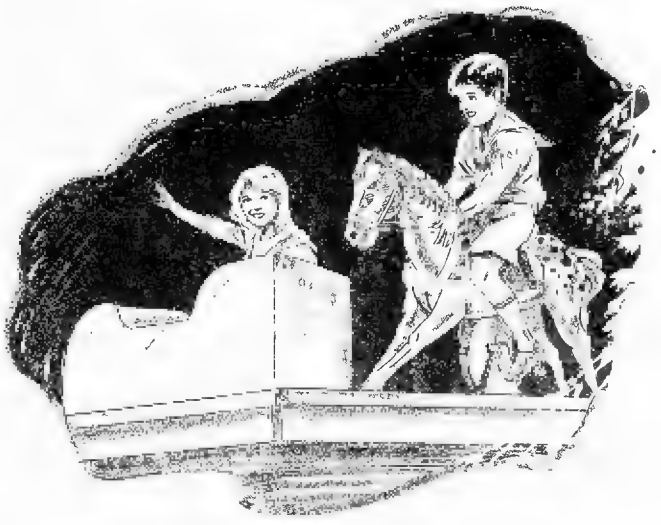
Give *the* Kids *a* Merry-Go-Round



By Eugene de Lopatecki

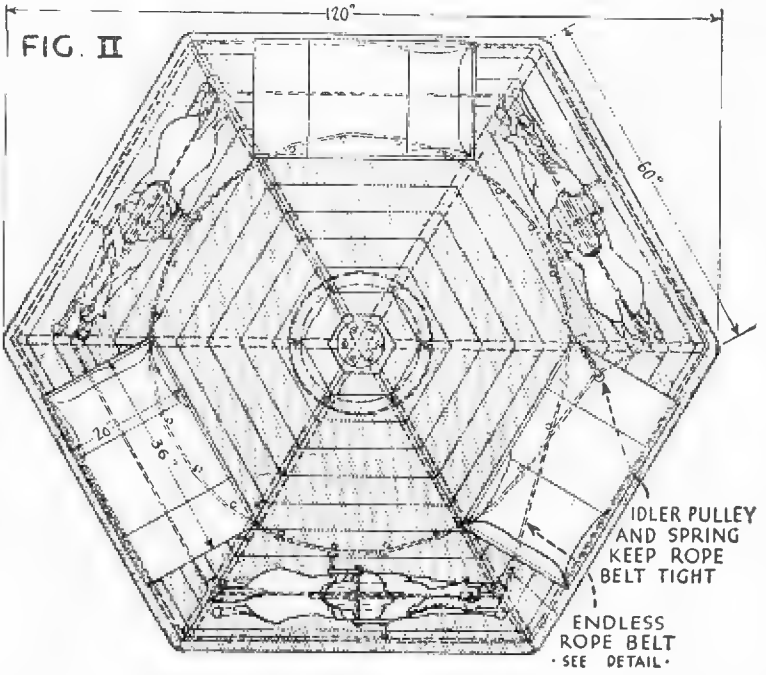
If You Know How to Use Simple Tools, You Can Make This Merry-Go-Round. The Kiddies Will Have a Grand Time with It

THE kiddies need not go to an amusement park and part with their dimes for a merry-go-round ride. A thoroughly practical merry-go-round can be made cheaply by any handy man with a flair for making things, and the novel device will make his kiddies the most envied youngsters in the neighborhood.

Glance at the accompanying sketches, and you will immediately gain a fair idea of the construction of this homemade merry-go-round. Fig. 1 shows the revolving platform assembly. The chief requisite is half of a rear axle housing and wheel from a junked automobile. It must be of the "full floating" type. This was the prevalent type used on old-time cars and it can be bought at "old iron" prices at any auto junk-yard.

It is well to choose an assembly that has six holes through the driving axle flange. This makes it unnecessary to drill additional holes at this point.

FIG. II



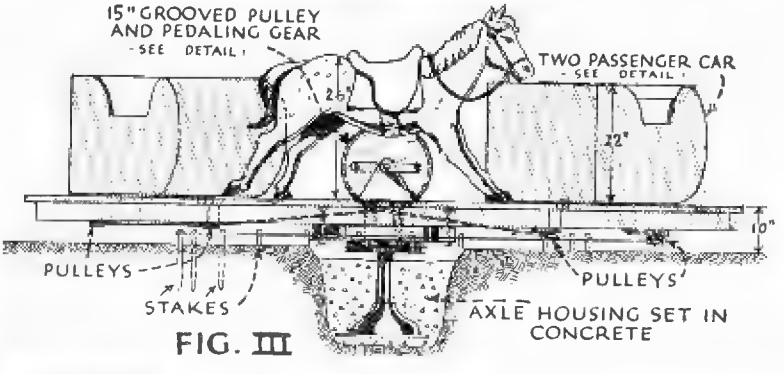


FIG. III

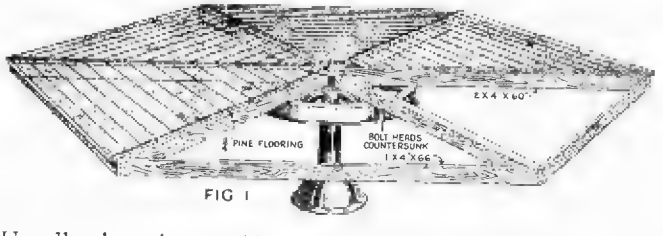


FIG. I

Usually there is an odd number of rim lug-bolts in a wheel, making it necessary to drive additional holes through the rim.

Fig. 1 shows how the six pieces of 2"x4"x60" wood are bolted radially to the face of the wheel. Also, how the flooring is laid. The heads of the outer bolts should be counter-sunk into the "two-by-fours." The inner bolts should have the nuts on top so that the driving axle flange plate can be readily removed to give access to the wheel bearings. The brake-drum, while non-essential to the construction, is usually an integral part of the wheel, and need not be removed. If the driving axle flange can not be readily driven or pressed from the axle, it is best to cut off the axle with a hack-saw, as it serves no purpose.

Figs. 2 and 3 show respectively the plan and elevation. Note that the axle housing is set firmly in the ground permitting the platform to rise about 10" above the surface. It is well to set the housing in concrete, but it is not absolutely necessary. If rocks and old bricks are tamped solidly into the hole, sufficient solidity can be had. The wheel bearings can be removed and the platform lifted off during the operation.

Before replacing the platform, a circle 6' in diameter and concentric with the axis of the merry-go-round, is laid off on the ground. 24 wooden or metal stakes, spaced equi-distantly, are driven into the ground around the circumference of the circle. These should protrude about 4". (*Continued on page* 363)

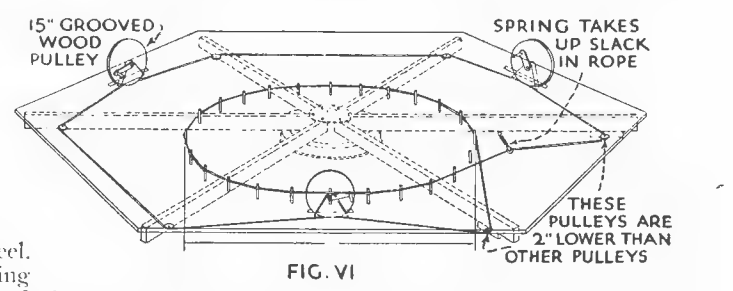


FIG. VI

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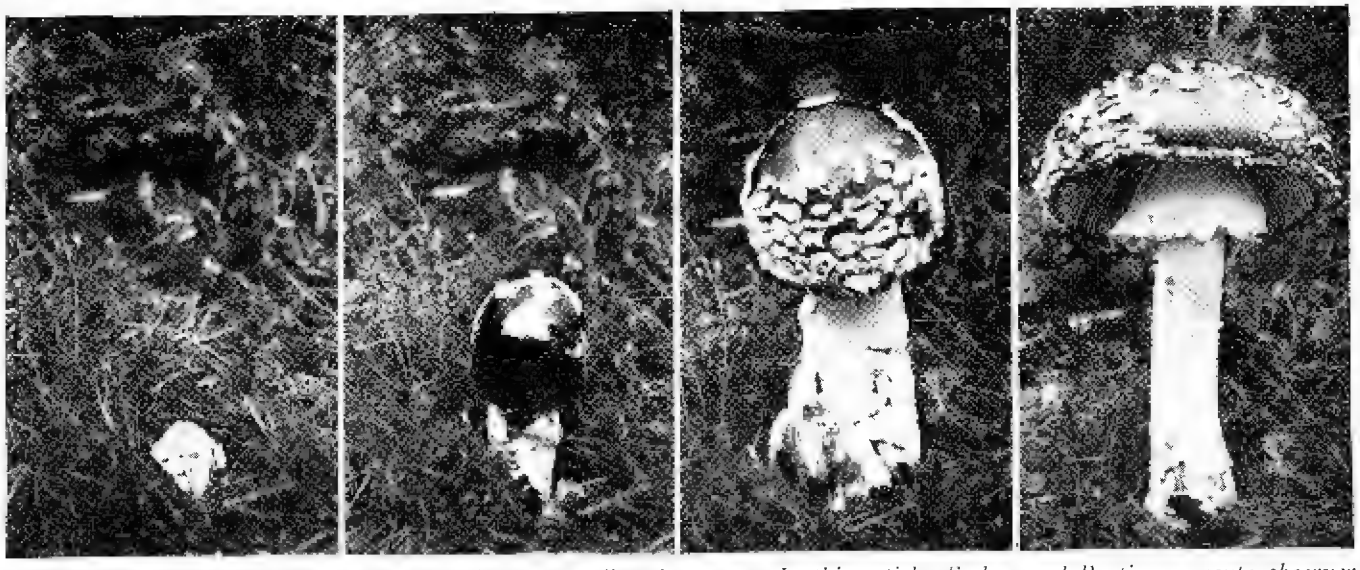
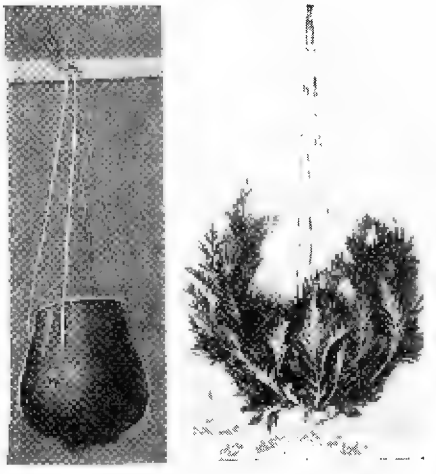


There's an adventure waiting for you beside every wall and in every fence corner. Behind every rock disintegrating in the shade. In every garden where ordinary vegetables grow. In this article, S. Leonard Bastin, an acute observer of nature's common, quiet complexity, tells you why. The pictures above show six hours of a toadstool's life.

Putting Plants Through Their Paces

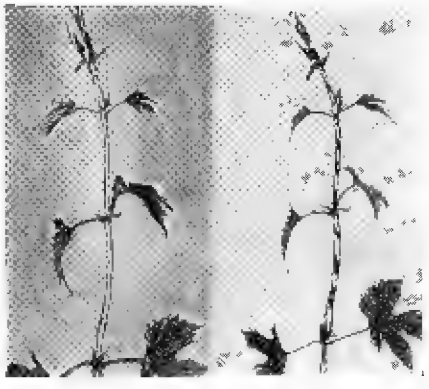
By S. Leonard Bastin



Did you know that you can make a pretty aerial plant of an ordinary carrot? Sure you can. Read the directions below.

ONE of the wonders of plant life is the growth of a toadstool. These often seem to appear all in a night but few realize how rapid is the growth. In the photographs at the top of this page is shown the development of the Fly Agaric fungus—common in woods—from the moment when it first appeared on the scene as a tiny white spot to its full development only six hours later.

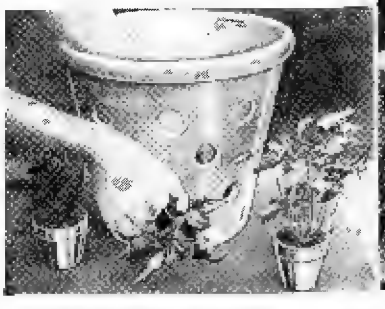
You can make a very pretty ornament for your indoor garden out of an old carrot stump. Choose rather a large one and trim away any leaves that are on it. Now with a sharp knife cut away about three-quarters of the carrot from the pointed end. Then, holding the stump upside down, hollow out the interior with the knife. Take care not to cut clear through the stump, as the hollowed-out part must be made so that it will hold water. Now bore four holes opposite one another in the upper part of the hollowed portion and, through these thread some twine in such a way that the stump can be suspended in the manner shown in the photograph. Fill the interior of the stump with water and hang the whole thing in front of a window in a warm room. Soon new leaves start to sprout from the stump and these will go on growing very rapidly. In the end the stump will seem to be covered with a fern-like growth which is very attractive indeed. Where, as in a window, the light comes chiefly from one side, it is a good thing to turn the stump round every day or so in order that all sides may get an equal amount of light.



The stem of a twining plant, like a hop or a bean, is continually twisting round. This may be proved in an interesting way as shown in the photograph. On a young hop stem a white vertical line is drawn. Twenty-four hours later the stem is examined when it is found that the line is no longer straight. Owing to the twist of the stem it has become spiral as shown in the second photograph.

It is possible in a large flower pot to make a fernery which will be a great ornament in a room and will continue to be beautiful summer and winter for years. Secure as big a pot as you can and then proceed to bore holes round the sides. These holes can be worked out by means of a steel chisel or an old augur with a somewhat worn bit might be used. As a matter of fact the pot is not really so hard as might be expected. (*Continued on page* 368)

You may have noticed how the stem of a climbing plant twists as it grows—but had you any notion of its rate of twist? You can demonstrate by marking the stem with a white, straight line. The photographs to the right illustrate the process of making a practical and lovely fernery in a pot. It's a matter of planting in vertical layers, mostly, and using the right soil in the right way.



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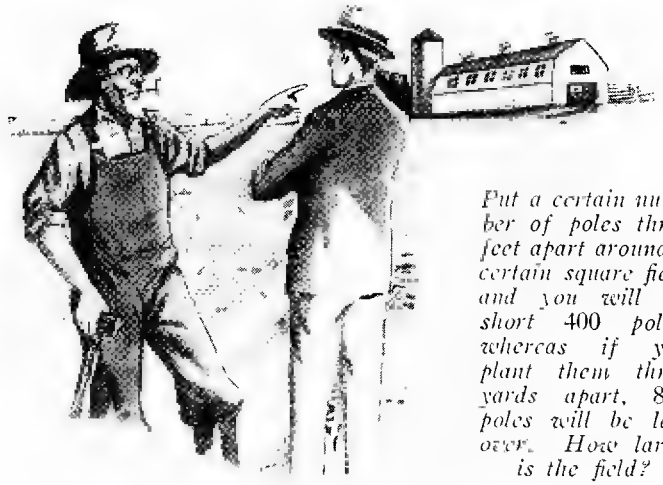
Prize Puzzles *to* Polish Your Wits

By Sam Loyd



Put a certain number of poles three feet apart around a certain square field and you will be short 400 poles, whereas if you plant them three yards apart, 800 poles will be left over. How large is the field?

THE Puzzle King presents the eighth of a series of problems, the solving of which will show if your mathematical ability is bolstered up by logical reasoning. Prize winners of the May puzzles will be found on page 370.

Science on the Farm

WHEN Farmer Brown's boy came home from agricultural college with his diploma, the old man said:

"Now Tom, let us have a friendly contest to see how much better your new-fangled methods are than my old ways. Take that square patch of land yonder, put a fence around it, and work it according to your books. When your scientific crop comes along we'll compare it with my harvest, acre for acre. There's a pile of logs behind the barn that we can use for your fence poles. Count them and let me know how far apart you want them set."

Tom later reported to his dad as follows:

"I find that if we put the poles three feet apart, we shall be short 400 poles, whereas if we plant them three yards apart, there will be 800 poles left over."

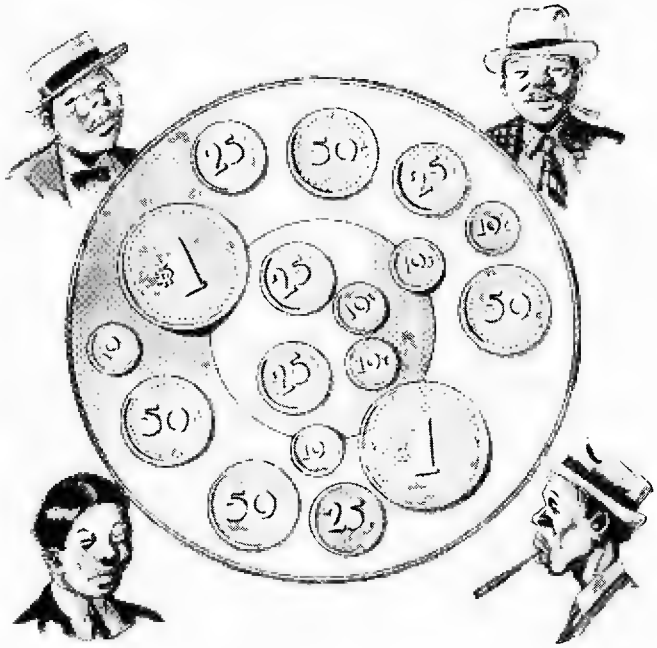
From those simple facts concerning the fence poles, figure out how many square feet there were in Tom's farm. Disregard the diameter of the poles.

American Fan Tan

AN Americanized Chinaman was explaining to me how his countrymen have adapted their ancient game of Fan Tan to fit United States coinage.

The old game is played with a bowl full of Chinese cash, from which the contestants take turns in withdrawing pieces, according to rules, until a final odd or even number, one or two coins, is left in the bowl. The player making that last play, which leaves the one or two coins, wins the stakes.

An American Fan Tan set consists of two one-dollar pieces, four halves, five quarters and six dimes, as shown in our sketch. The game is played by from two to five persons, and hedged round by rules too abstruse for a mere Occidental; so I will present a simple pastime evolved from that same layout of seventeen coins.



Our game will be played by only two persons, who take turns in removing coins from the plate until a final coin is left, and the player who faces that lone coin at his turn, loses the game.

At each turn, it is a player's privilege to remove one or more of the pieces of a single denomination—but not two kinds at the same turn.

For example, a player might elect to deal with the dimes, and of these he may remove one, two, three, four, five, or the entire six.

And so, the game progresses until a final coin results. Here is a specimen game between A and B:

A removes a dollar, B two halves, A three dimes, B four quarters, A a dollar, B two dimes, A a half, B a dime, and A then wins by removing either of the two remaining coins.

In explaining the game to my Oriental friend, I extended him the courtesy of opening play. He promptly removed all of the coins of a certain denomination, and that left me with a losing game, provided he continued to play without error.

Which denomination did he eliminate, and why did that play insure my being left with the final coin?

Twenty-five Dollars in Prizes

A FIRST PRIZE of $10 will be awarded to the person sending correct answers to the two puzzles *accompanied by the best expressed analysis of the Farm Problem.*

A SECOND PRIZE of $5 will be awarded for the next best analysis and correct answers to the two puzzles.

TEN PRIZES of $1 each will be awarded to the ten persons who send the next best analysis of the Farm Problem, together with correct answers to the two puzzles.

Answers must be received not later than noon, August 15, addressed to "Puzzle Editor," SCIENCE AND INVENTION, 381 Fourth Avenue, New York City.

All contestants must abide by the decisions of Sam Loyd, who will examine all papers and award the prizes.

Papers of identical merit, tying for any one of the prizes, will each receive the full amount of the prize tied for.

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THE SAFETY

Conducted by

Readers' Opinions and Comments

More Psychology

YOUR article in May number of SCIENCE AND INVENTION entitled, "Behind the Human Front," by Edward J. Beck, interested me very much. I do not claim to be a psychologist, but in my different occupations as railroader, handling passengers, a photographer, an officer of the law, a detective and as a general repair mechanic, I have picked up a few things that are interesting as well as unique, and akin to Mr. Beck's experiences.

Once I overheard an old darky telling a younger one, who had just complained of his wife's accusing him of being out with other women, that "any time you see a woman all the time kusin' her husben runnin' atter other wimmen, keep your eye on her. She is only doin' that so if he should ketch her with some odder man, she would have a cumback at him so's to shield herself." I determined to test this and in 99 out of 100 cases have found the old darky knew his women. They usually are worse than their husbands.

A woman prevaricator is the easiest to catch in a fib or a lie. I have never found one that could tell me a lie and not be caught at it. All you have to do is to wait a few days or weeks. Then have her repeat the story; if she originally had told the truth she will tell it almost exactly as she did the first time, but if she had told a lie she will have forgotten how it was told and will vary it in many respects. The fun begins then and you can get her so mixed up, that she cannot retrieve herself. Some men are the same, but most men, if they are at all intelligent, will remember and repeat the lie exactly as they did at first.

In the photo business for over 25 years, I noticed that eight of ten women when they came to see proofs of their sittings would remark: "They don't look a bit like me." As I always prided myself on being able to get at the root of things, I asked hundreds of women why they said that. None of them seemed to be able to tell me. I knew most of them did not do it through vanity and only a few were fishing for a compliment, so one day, when a lady who was a personal friend and very sensible looked at her proofs and said the same thing, I asked her if she had left the studio the day she had the sittings made with a definite image in her mind of just how her picture would look. She laughed and admitted it was so. After that I asked them all the same question, and only one had not admitted that it was a fact.

I have also learned to never show a proof to strange people unless they leave a deposit, as many times they will walk out, if they do not like the proofs, and never come back and go to some other studio, without giving you a chance to have another sitting. In kodak finishing I always seal prints up and will not open them till they are paid for, for there is a large class of the lower element that does not have the money and after seeing the pictures lose all interest in them. The public reacts to photos as they do to music; very few people have any basis for judging. Another bird is the one that never wants to pay a deposit, or to put down any money for anything. Even men have a list of alibis as long as a prohibitionist's excuses for not enforcing the prohibition laws. They will say, "Oh, I want my pictures, and I will take them out." I tell them that they all say the same thing. They howl long and loud about their honesty, and the more they howl the less likely they are to call for their work.

I was once asked to define a "Scissor-bill." Well, I consulted the dictionary, the World's Atlas, Ancient and Modern History, without getting an adequate definition. He is the kind of man who claims that he took his watch to John Smith's shop and the watchmaker stole the jewels from it. The highest priced genuine ruby jewels in solid-gold settings cost the jeweler less than $4.00 per dozen, and the kind he had in his watch cost about $1.50 a dozen. No jeweler would go to the trouble of taking out a jewel from a cheap watch when such jewels only cost from 15c to two bits apiece. He is also a gink that has the oldest violin in the state, running from 100 years back to three years before Adam was born, depending on his imagination or how ignorant he thinks you are. "Yessir-ree, it's a jennuwine Strad fer it has the date pastid on the inside, and has the most wonderful tone while it has steele strings on it." This bird always has the best horse, the best shooting gun and the oldest fiddle in the country, especially if he wants to sell it.

Another specie of genus bohunkus is a young wart who lives out in the tall and uncut. He gets himself an old Ford car for about ten to fifteen simoliens and takes it apart; if he gets it back together, he is a mechanic, in box-car letters. Next week he goes to town and gets himself a job in a garage at six bucks a week. After he works two weeks he graduates, and at the end of the month he is an EXPERT, and all he really knows is to "race" the motor and flatten the bearings and shackle the bolts in the frame and body till it nearly falls to pieces. If it is a "hick" town he draws his little six iron men Saturday night and goes downtown and gets him a hot-dog and a coca-cola and then stands on the sidewalk and spits tobacco juice till it looks like a flood. He goes home about ten, and next morning gets in an old dilapidated excuse for a car and rides the rest of his week's wages out in gas and oil. The South is full of this species of mechanics.

You can usually tell a Scissor-bill even if you can't see him, if he is anywhere around. You can hear him three blocks. The more ignorant, and the less he knows, the more and louder he talks. And if he is driving a car, he is sure to have the cut-out wide open to attract attention.

A. L. BUTCHER.
Maryville, Tenn.

How You Make Us Blush, Fred

ONE of the features which invariably attracts me to SCIENCE AND INVENTION Magazine is the page devoted to the opinions (intelligent or otherwise) of your alleged editors in response to questions submitted by an adoring reader public. One thing that has impressed is the finality with which these queries are answered. After reading several of Mr. Kraus' scholarly opinions on subjects varying from a discussion on the benefits of electro-magnetic belts to the disadvantages of awarding gold-plated receptacles for model contests, my imagination portrays Mr. Kraus as more imposing than the Great Jove.

Spiritualism also comes in for more than its just share of space on these two precious pages. It seems to be a failing of the editor that he will give space to any superstitious school boy who is sold on the idea that, like the famous Joan of Arc, he has heard voices, smelled spirit odors, and seen trumpets gyrate about the room without any apparent human influence. For the materialistic mind of scientific readers, the discussions on spiritualism have just about reached their saturation point. For the love of the Great Dunninger, give us a little change from the constant fare of outpourings of hallucinated minds and minor mentalities.

Several months ago, one intelligent reader of SCIENCE AND INVENTION complained about the editorial policy of nursing along the buyers of quack medicines and patent cures. No doubt, there was a vast protest from the many righteous-minded, who saw in such a letter the workings of a villain interested in separating a slightly ludicrous public from its hard-earned cash. However, it is my opinion that to warn the readers of SCIENCE AND INVENTION about a medical fraud is merely to divert their interest to other channels of quackery such as chiropractics, osteopathy, hydrotherapy, and the many other so-called scientific cures which the Federal Trade Commission and the National Better Business Bureau have not seen fit to crusade against. In connection with frauds, it might be suggested that the wily business man works on the theory that "Once a sucker—always a sucker." This is evidenced by the fact that sucker lists are frequently sold and bartered by the exponents of stock-selling schemes, gold mines, and oil wells which are just about ready to gush, but scarcely ever do. It is no doubt the duty of a righteous-minded editor, and I am quite sure that SCIENCE AND INVENTION has its share of righteousness, to expose any frauds which come to his attention. However, the undertaking of such a process of enlightenment and exposure is a vast one. It has many ramifications and often cannot be settled with the finality with which Mr. Kraus is wont to settle it. If an advertiser offers his "cure" to the public, with a barrage of ridiculous adjectives and crude art work, it seems to me that he is no more guilty than many of the more prominent advertisers who make claims such as "Toasting removes all

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VALVE

Joseph H. Kraus

Will Be Welcomed by the Editors

irritation"; "Not a cough in a car load"; or "Milk from contented cows."

If the Safety Valve contained more letters from the readers anent their opinions on the various articles published in the magazine, I think it would prove helpful to the editors, and no doubt prevent them from publishing articles like "Hook Yourself A Rug, "Merely on the Surface," and "Unkinking Cleveland's Traffic." These articles have given me as much joy as the recital of a go-getting mortician of his latest piece of business—the large and sumptuous funeral of a beer runner. Amen.

FRED WITNER,
Madison, Wis.

(The editor has never laid any claims to infallibility. He always tells the truth or what he believes to be the truth, and does not care whether Mrs. Grundy likes it or not. We try to render the best scientific opinion on those questions and topics upon which information is requested, and there are no two ways about true science. If we err, we are very glad to have the error pointed out.

It is true that spiritualism receives due attention and consideration. Approximately one out of every five letters which are received by the editor of this department are on the subject of frauds and humbugs, among which we find spiritualism, astrology, phrenology, palmistry, and medical quackery. Technical inquiries are properly taken care of by the able editor of the Oracle Department.

Our $21,000.00 contest on spiritualism is still awaiting a taker; and this, after more than seven years. Surely you must realize that if those manifestations purported to be produced by spiritualistic effects have all suspicion of trickery removed from them, and the scientific yardstick can be applied, we are on the way to make a momentous discovery in developing a new force entirely unknown to science. Unfortunately for this publication, and also for the spiritualists, such a force has never been demonstrated to us.

Two wrongs do not make a right. Advertising the toasting of tobacco, milk from contented cows, or coughless cigarettes, is decidedly different from advertising that same milk as a cure for 76 diseases, or the cigarettes as a substitute for a cough medicine. From a factual standpoint, both cigarettes and milk would be of greater benefit than some of the mechanical nostrums that are specific for various diseases. If we can, in only a small measure, disseminate what we consider to be the truth about medical cheating devices, we shall feel amply repaid. Many who are suffering from a disease have resort to advertised "cures" that are totally worthless. The ravages of the disease become aggravated, while the sufferers rest under the false security of advertised virtues. When medical assistance is at last called upon, it frequently happens that the case is so far gone that medical intervention can be of little further service. The physician finds himself handicapped. He can now do nothing else but allay the pain with narcotics, assuage the grief of the relatives and sign the death certificate. Had he been called in earlier, music from a jazz orchestra might have been substituted for the sepulchral tones of a pipe organ.

These pages are an open forum. Any reader is at liberty to comment upon the articles appearing in this publication. Do not be too sure that others who read SCIENCE AND INVENTION *Magazine may not be interested in the very articles that did not please you. We have an idea that the mortician may have gotten quite a kick out of the beer runner's funeral. He saw his duty, did it, and undoubtedly got paid handsomely for it.*—EDITOR.)

A Bouquet for the Family Doctor

IN the February issue of SCIENCE AND INVENTION the editor asked Mr. C. Soderstrom of San Francisco, California, if he would not be criminally liable if one case of well marked diphtheria died under quack treatment without exhausting science.

The same logic and legal reasoning used by the editor carried into the so-called science of medicine would make every medical doctor criminally liable for every patient that dies under his system of treatment, consisting of horse blood or lymph called serum, and did not give the case the benefits of the real science of Chiropractic. If the editor doubts the harm that comes from anti-diphtheria and similar serums, let him send one dollar to the American Medical Liberty League of Chicago, Illinois, and request information. One must pay for what he gets.

I trust that the editor of SCIENCE AND INVENTION will continue to press the cause of medical monopoly and brand the rest of the world as quacks—all the sooner will public opinion crack down on the monster medicine that parades under the flag of science and in that name has killed more and done less good than all the wars of history put together.

Take the product of quackery out of medicine and it stands there like a great pile of ashes with the flame out. Science is science and medicine is quackery.

WILLIAM H. JAHN,
Hallettsville, Texas

(The editor certainly does not doubt that harm can and on occasion does come from serums, but the harm is out of proportion to the benefits that such serums produce. Out of 330 healthy people who never came in contact with diphtheria patients, so far as was known, virulent diphtheria bacilli were found in the throats of eight of them, and two of them later developed the disease. Laboratory workers who have accidentally sucked up virulent bouillon of diphtheria bacilli developed the disease. When diphtheria antitoxin was used in treatment and for immunization, about one in 10,000 people developed alarming symptoms. In those cases where the antitoxin is used in time, the death rate per thousand takes a very material slump. Any table on vital statistics compiled for the entire United States will indicate that in those parts of the country where antitoxin is used, the death rate is consistently lower than where it is not used. In 150 cities, 183,256 cases were treated without the serum, the mortality rate being 38.4%. Serum was then introduced, and in practically the same number of cases, the mortality dropped to 14.6%. In Chicago from 1888 to 1893, the total number of deaths from diphtheria was 11,488. From 1896 to 1903, the period during the use of antitoxin, the deaths were 6,088, a decrease of 47%. Of 586 cases treated on the first day of the disease, there were only two deaths. If all the diphtheria cases were promptly treated on the first day of the disease, the mortality would be considerably lower.—EDITOR.)

Ye Editor Takes It on the Chin

HOW much longer must the long-suffering readers of your publication suffer from the hen-brained comments of the apparently very new managing editor, Murray Godwin, who seems to be afflicted with the notion that he has a corner on the inside stuff about the entire universe, including the astronomical, penological, automotive, social, and every other aspect?!!!

In your July issue, under the usual title, "The Way I See It," Mr. Jehovah Godwin takes a lusty poke at Dr. Gilbert N. Lewis and his new theory of time, which seems destined to be of great practical value in the world of experimental science. The attack is altogether unjustified and only serves to reveal the possibly useful fact, that Mr. Godwin is a complete ignoramus regarding the subject in question.

I was, however, delighted to note that toward the conclusion of his scurrilous assault, your so-called editor lapsed into the vernacular of his native East Side, thus furnishing his own refutation of the argument which he had advanced.

Trusting that you will discontinue Mr. Godwin's contributions in the very near future, I remain,

MELVILLE T. THAYER,
Needham, Mass.

(There is always one day in the month when we glance across the aisle and see our square-jawed, carrot-topped Managing Editor burning up the asbestos ribbon on his water-cooled typewriter. From the look of intense concentration, we know that he is in the midst of great thoughts on trivialities, and we can tell from the highly charged atmosphere that the page known as "The Way I See It" is in the throes of creation. While "Doctor" Godwin thumbs his well used encyclopedia in the hope of successfully refuting the bombastic discharges of publicity-minded professors, we seek refuge in our two pages known as The Safety Valve, and laugh up our sleeve.

After working with Mr. Godwin for some time, we can vouch for the fact that he is not exactly an ignoramus, nor are his comments always hen-brained. We think very highly of his comments, and also his rather unique presentation of them. In addition, we admire his state of skepticism which permits him to see beyond the news columns and view what really is "Behind the News."

We are not considering the removal of his "The Way I See It."— EDITOR.)

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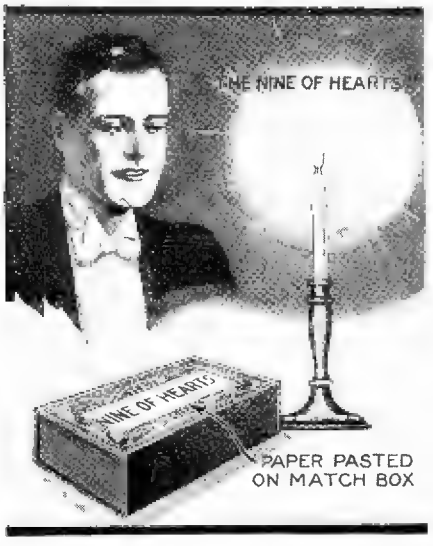
MAGIC

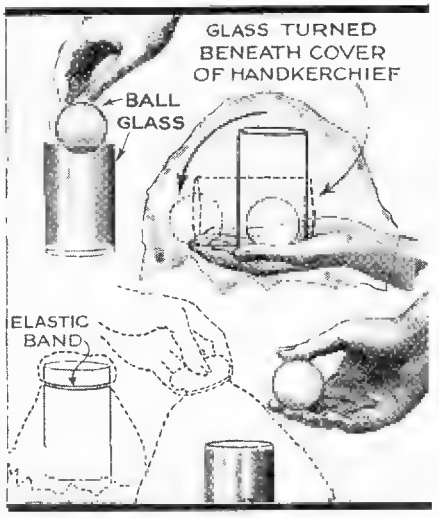
By Hunninger*

A Message from the Other World

THIS is an entirely new method of producing spirit slate writing with which any conjurer can easily outdo the cleverest spirit medium. Although there are many methods of producing messages upon slates, few of these are practical for producing those same messages on unprepared slates that can be initialed by the spectators.

A slate, which the spectator can bring himself, is initialed by him and then he, instead of the magician, is asked to hold it under the table during a few moments of meditation. The magician then permits the spectator to convey the slate to the top of the table, where a so-called message is found to have been written with chalk. The secret lies in the fact that a large rubber stamp has been fastened beneath the table top, the lettering of which stamp has been well chalked prior to the demonstration. The magician or medium, also seated at the table, need merely press the slate against the pad while the other holds it beneath the table-top. The message is naturally transferred very quickly, but a certain amount of showmanship is needed to carry the effect across. Only one message is possible for each stamp, several of which could be fastened beneath the table-top.





Novel Thought Reading

THE magician explains that by gazing into a flame of a burning candle, he finds himself inspired to read thoughts. During his absence from the room, a card is freely chosen from a deck and then returned. The deck is then pocketed by a spectator. Searching around for some matches, the magician is handed a box by one of the spectators, he lights the candle, and correctly names the card. The secret lies in the fact that a piece of paper has been pasted to the box of matches, upon which the spectator assistant has written the name of the card.

The Diabolical Colors

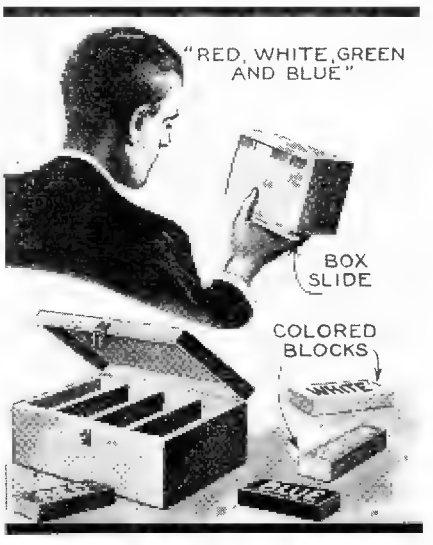
A SMALL box of four compartments is arranged to accommodate four differently colored blocks. While the magician leaves the room, the blocks are placed in the box, which is then locked. On his return, the magician holds the box to his forehead and correctly names the arrangement of the colors. A slide bottom gives him the information.

Unique Billiard Ball Trick

EXCEPT in sleight of hand, all sorts of paraphernalia are used by the average magician. In this effect, the material is obtainable almost everywhere.

The magician borrows a tumbler, a large non-transparent handkerchief, a billiard ball or an egg, and a rubber band. For the purposes of illustration, we will say that a ball the size of a billiard ball has been procured. The magician takes this between his fingers and unquestionably drops it into the glass tumbler. The tumbler is then covered with the kerchief and a rubber band is placed around the upper end of the glass. The affair is now put on the table, and after making a few mystic passes over the glass, the ball is found between the magician's fingertips. The handkerchief is lifted, indicating that the glass is empty.

To successfully perform this trick, the amateur should practice inverting a glass under cover of a handkerchief without making the move noticeable. The tumbler is cylindrical. After the glass is inverted, the rubber band is snapped around the handkerchief at the bottom of the glass, but which spectators believe to be the top. If the amateur is not an adept at palming, he can bring the ball into view at this point.



*No. 83 of a Series of Magical Articles Appearing Monthly.

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Let's Laugh

ALL jokes published here are paid for at a rate of $1.00 each; $3.00 is paid for the best joke submitted each month. Jokes should be scientific. Write each joke on a separate sheet of paper and add name and address to each sheet of paper.

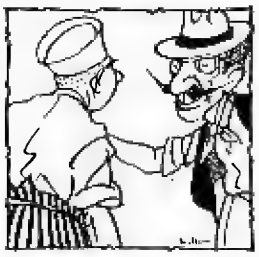
TRICK STUFF

FOND MOTHER—Don't you think Junior does wonderfully? He plays the piano entirely by his ear.

DUBIOUS CALLER (in next room)—Really? But couldn't he do much better with his fingers?

—*W. W. Hatfield.*

FIRST AID



"Help, help," cried an Italian laborer, near the mud flats of the Harlem River.

"What's the matter there?" came a voice from the construction shanty.

"Queek, queek! Bringa da shov! Bringa da pick! Giovanni's stuck in da mud."

"How far in?"

"Up to his knees."

"Oh, let him walk out," was the reply.

"No, no! He no canna walk! He wronga end up."

—*Cuvier W. White.*

OR SEEDS THAT WILL STRETCH

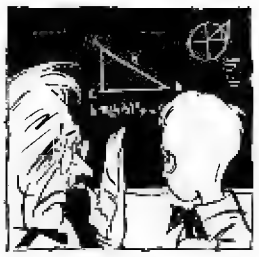
SLAM — Hear about that fellow Edison down in Florida who is trying to graft the rubber plant on an orange tree?

SLOW — Yes, I can't figure out if he is trying to get an orange that will bounce, or rubber that can be made into gum with an orange flavor.

—*Leslie F. Carpenter.*

First Prize—$3.00

NO ARGUMENT



GEOMETRICUS—Let's hear you prove that the square of the hypotenuse is equal to the sum of the squares of the other two sides of the triangle.

STUDE—Let's not waste time professor, let's admit it.

—*Ralph Rhodes.*

THE YELLOW PERIL

DR. CUDDUM—How did that diagnosis machine work you had installed in your office for a while?

DR. CUREUM—That? Say I treated a guy for three months because that old machine said he had yellow jaundice.

DR. CUDDUM—And did that prove to be the case?

DR. CUREUM—No—he was part Chinaman.—*Leslie F. Carpenter.*

NATURAL

FIRST STUDE (to second stude in electrical lab.)—Say, watch yourself there. Keep your hands away from those transformer terminals if you don't want to get burnt up.

PROF. (dryly)—Never mind; anything as green as that won't burn.

—*F. S. Bock, Jr.*

RADIO ACTIVE

MOTHER—Mary, can you tell me what became of that tinfoil that I bought the other day at the store?

MARY—Why, Mrs. Smith came over today and saw it and asked what it was for. You told me it reduced body capacity. Poor thing, I do hope it helps her, she has tried almost every other thing but tinfoil.

—*Fred Erdos.*

PERPETUAL MOTION

JONES—How did your article on perpetual motion turn out?

BROWN—It's a great success. Every time I send it out it comes back!

—*Lenny Wyckoff.*

DISTINGUISHED SERVICE

FIRST SOLDIER — Where were you when the battle was raging?

SECOND SOLDIER—I was right where the bullets were the thickest.

FIRST SOLDIER — Where was that?

SECOND SOLDIER—Under the ammunition wagon.

—*Morris Chodorow.*

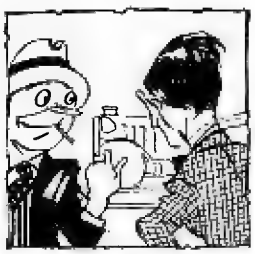
THE ONLY GOOD ONES

HUNT—How do you like radio sopranos?

BLUNT—Dead.

—*John H. Spicer.*

AND WASN'T IT?



BUYER—You say that this car has been overhauled?"

SECOND-HAND DEALER—Sure, by every thing on the road.

—*Len Zinberg.*

PERHAPS

PROFESSOR—Why is Mexican crude oil good for making gasoline?

STUDENT—I guess because it has so many revolutions in it.

—*H. M. Bartlett.*

Scienty Simon—*Scientist*

SCIENCE LESSON
No. 45

ICE-CREAM IS NOT A COOLING FOOD... ON THE CONTRARY IT IS A FOOD WHICH PRODUCES MUCH HEAT IN THE BODY... THE SUGAR, CREAM AND STARCH THAT GO TO MAKE UP ICE-CREAM ARE ALL CLASSED AS FUEL FOODS, THAT IS, THEY BURN INTERNALLY TO PRODUCE A LARGE AMOUNT OF HEAT... IF YOU EAT ICE-CREAM IN HOT WEATHER, YOU MAY ENJOY A TEMPORARY COOLING, BECAUSE OF ITS LOW TEMPERATURE, BUT ULTIMATELY YOU WILL FEEL WARMER AND MORE UNCOMFORTABLE THAN BEFORE.

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Does She Swim?

George H. Dwyer, of Brooklyn, N. Y., writes:

Q. Recently while visiting the amusement parks in Coney Island, I visited a side show which contained nothing but illusions, and while I have seen some of these explained in your maga-

The observer of this magical illusion sees the performer swimming in thin air. See the illustration in next column.

zine, there is one that stumped me completely. A girl in a bathing suit makes complete circles in the air, changing her position while she does so, and yet there is no visible means of support. Can you explain?

A. This is a very old optical illusion. The effect is generally viewed through a transparent muslin screen that is stretched across the front of the exhibition stage. Generally some scenery, such as a setting sun, clouds and water, is painted on a background of canvas. Behind the scenes you would observe that a sheet of plate glass has been placed at an angle of forty-five degrees with respect to the front of the stage. The performer who apparently swims around in the air is actually lying on a turntable, and a powerful set of lights on each side illuminate her. Her image is reflected by the plate glass, so that the observer apparently sees her standing upright just in front of the canvas backdrop. In order to give the audience the effect of her floating in air, the girl changes her position on the turntable while the attendant causes it to rotate slowly. The performer can thus apparently execute a large circular flight, or can bunch herself up into a knot at the center of the turntable and give an imitation of an aerial pinwheel. You probably also noted that at the termination of the performance, the girl apparently dove right into the water and disappeared from sight. This effect is accomplished by pulling the turntable away from the mirror, thus cutting off the reflection as the girl disappears. The explanation is given in the two accompanying diagrams.

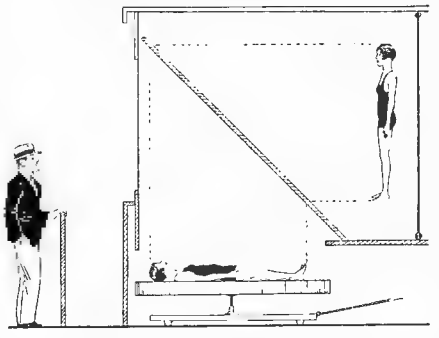
Fog, Black as Night

James J. Miller, Minneapolis, Minn., asks:

Q. 1. Can you give me some information concerning black fog and the cause for its formation?

The Oracle

A. 1. This form of fog occurs in cold weather over the open surfaces of rivers. Winter fog on the comparatively warm water of the river always appears when the temperature falls to 11 degrees F. This fog rises in columns and hair-like forms. Black fog, however, only occurs at sub-zero temperature and appears to be a precipitation of heavy semi-fluid water particles which seem to absorb the sun's rays. It is preceded by a white fog early in the morning, which is known to rise upward to a height of 1,200 ft. When the sun rises, white fog disappears and the color changes to yellow and then rapidly to an opaque black. It is the action of the sunlight which causes this transformation. The white colloidal particles are changed to a deep, heavy, black form. Additional information



The performer is really lying on a slowly revolving table. A mirror is placed so that she appears as shown in the illustration at left.

concerning the formation of fogs and mists will be found in a book entitled, "Ice Engineering," by Professor H. T. Barnes or in almost any good weather book.

Not "Fool's Gold"

Maxwell Blynn, Ottawa, Canada, writes:

Q. 1. Will you please publish the composition of the various colored golds which are used at the present time.

A. 1. The colors imparted to gold are produced by the careful preparation of an alloy. Green gold consists of gold, silver and cadmium, and sometimes copper is also added. The degree of the green color depends upon the percentage of the metals used with the gold. Pale yellow gold consists of gold and silver and dark yellow of gold, silver and copper. Pale red gold consists of gold, silver, and a large amount of copper. Dark red gold consists of gold and copper only, and grey gold of gold, silver and steel. The popular white gold alloys are made from nickel, traces of iron, palladium, silver and zinc. Gold is also alloyed with aluminum for use in the manufacture of cheap goldware. Its color resembles that of pure gold, and remains unchanged in air. This alloy contains a quantity of copper.

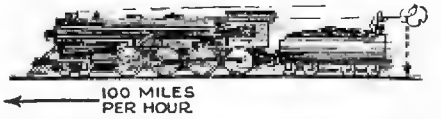
The oracle is devoted to questions of general interest to our readers. Direct mail answers will be given at the rate of fifty cents per question.

The Oracle Editor Keeps His Chin Out

In the April issue of Science and Invention, we published a question submitted by David Watkins, of Kansas City, Mo. He stated that in a discussion in his physics class, the following problem arose. A train is traveling north at the rate of 100 m.p.h.; a gun is fired from the train at the same rate in the opposite direction. Mr. Watkins claimed that, to the observer on the ground, this bullet would appear to drop immediately without traveling any visible distance. We supported him in his contention, and as usual when a problem of this type is published, considerable discussion arose. One of our ardent readers, Mr. Werner Buerke, of St. Louis, Mo., wrote to Dr. Donald H. Menzel questioning the correctness of our statement.

Dr. Menzel answered him in part as follows: The solution of the problem, as published in the Oracle Department of Science and Invention Magazine is correct. To an observer standing on the ground the bullet will appear to fall as if it had been dropped from a stationary point above the track. If the bullet is fired from a point sixteen feet from the ground, it will strike the ground in one second whether or not the train is moving. If the train is stationary, the bullet will strike the ground 147 feet away. (147 feet a second is taken as 100 miles an hour.) If the train is moving at 147 feet a second, it will be 147 feet away from the point where the bullet strikes. Of course, the average bullet that is shot from a gun moves more rapidly than 147 feet a second. That, perhaps, is what confused you.

Our intention in publishing this letter from Dr. Menzel is not to vindicate our ability to answer all questions correctly, for the title of this department is certainly a misnomer in that respect. However, when we publish a question of this type and our answer to it, we believe



The train and bullet travel at the same speed in opposite directions. A restatement of a question in the April Oracle Department.

that in the case of any discussion on the matter it is always better to seek a more expert opinion than our own. We think that Dr. Menzel is fully qualified to settle the question with more of a degree of finality than ourselves.

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CONDUCTED BY JOSEPH H. KRAUS

In this Department we publish such matter as is of interest to inventors and particularly to those who are in doubt as to certain patent phases. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries are published here for the benefit of all readers. If the idea is thought to be of importance, we make it a rule not to divulge all details, in order to protect the inventor as far as it is possible to do so.

Should advice be desired by mail, a nominal charge of $1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.

NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.

Selling Before Patenting

(1226) Donald P. Olson, Denver, Colo., asks several questions, the nature of which is made clear in the answer and also asks advice about several inventions.

A. 1. While it is not always safe and in some cases not always advisable to market an idea before a search and an application for a patent is made, this procedure is very often carried out with a view toward securing some money before the patent actually goes through and also in an attempt to establish a market as rapidly as possible. Articles are thus usually stamped "patent applied for," the object being to let other manufacturers know that the article is actually being protected and that any infringements would be prosecuted under the full extent of the law.

Whenever you disclose an idea to a prospective purchaser, always have him sign a slip of paper indicating that he saw the apparatus on a certain specified day, and that he knows the operation thereof. This will give you further priority preference. While it is not always sufficient to merely send the idea to yourself in a stamped and sealed self-addressed envelope, this is a means of establishing priority. Any other method of tying up the date with the inception of the invention helps in this priority protection. In an important case you can never have enough such claims. It is possible that any prospective purchaser will express an opinion before a patent search is made. If he offers to buy, you need not continue with patent proceedings, except to apply for the patent and assign it to the manufacturer.

The letter scale which you have suggested has several advantages, and a product of this nature might be worth while for a five and ten cent store trade. Unfortunately, most letter scales are not accurate due to the ever fluctuating and changing rates of postage. Air mail for instance is cheaper today than it was only a few months ago. Spring scales for postage are good as a cheap product, but they are very inaccurate, and by no means will they surpass those types which depend upon a movable weight for their action. A device of this nature might, however, meet with a small degree of success, depending entirely on how it is exploited and upon the backers of the project.

The wrist watch support is fair, but scarcely the type of an article that would sell, except as a box for holding this jewelry, and in this particular instance, other individuals might be able to market a similar device and sell it, together with the watch, preventing you from even getting an interested market. We suggest no further action along this line.

Enclosing rubber in a gasket of oil preserved brake lining or some other tough fabric is not a material improvement of the suggestion you made previously, and we can see no advantage to the idea whatever. We do not think that you could get a sufficient protection on an idea of this nature.

There is no reason why you should be reluctant to ask this service and we trust that you will take full advantage of it at all times. We do not attempt to financially aid any inventors; our interest is purely one of assistance to those who read this publication, to help them make better use of their ideas by showing them the pitfalls and the difficulties of marketing an invention, if it presents such difficulties; also with the idea of encouraging them and helping them along, if the suggestion proves to be worth while. We know of quite a number of instances wherein readers have taken out patents on our suggestion and have been very successful with them.

Protection

(1227) Isaac Daehlin, Freeport, Ill., asks if he will get sufficient protection by applying for a patent.

A. 1. Any individual can apply for a patent and pay the first government fee, after which he receives a serial number. This, however, only establishes a claim of priority, and it does not protect the inventor in the least, no more so than the establishment of any other claim of priority.

In order to secure a patent on any idea, we always recommend the employment of a patent attorney. The reason is that a patent attorney can draw up the claims properly, and can give you the assurance of full protection. There is no way of protecting an idea other than by securing a patent. It is not until the claims have been allowed and their validity established in court that the inventor gets 100% protection.

Can Perforator

(1228) J. A. Nolan, South Gate, California, has designed a cap-like fitment to be used as a means of perforating cans of milk and to be used as a cover for those cans. He asks our advice.

A. 1. We doubt very much that the device that you have designed would ever meet with a successful market. Some years ago organizations that sold canned milk were giving away a device very similar to yours, except that instead of being made in the form of a cap, the article was in the form of a narrow flat strip of metal with two depending points. These points were used to open the milk can and also were effectively employed for sealing the same.

The item was, of course, substantially identical with your device, but never met with a very extensive sale. Its construction as you can see is considerably cheaper, and it did the work because it was only necessary to cover the holes and the lips on either side of the holes so that they should not be contaminated.

With this device it is much easier to find the holes and seal them.

Radiator Drain Control and Can Spout

(1229) Albert Scollosy, Plunket, Sask., Can., submits an idea.

A 1. We would advise that such radiator drains tap controls are already available on the market. About six years ago practically every Ford dealer in the country was able to supply you with a device of this nature, which could be attached directly to the present day tap. There was no need of making any changes other than drilling a small hole right through the petcock. We are extremely doubtful that you could do anything with this suggestion.

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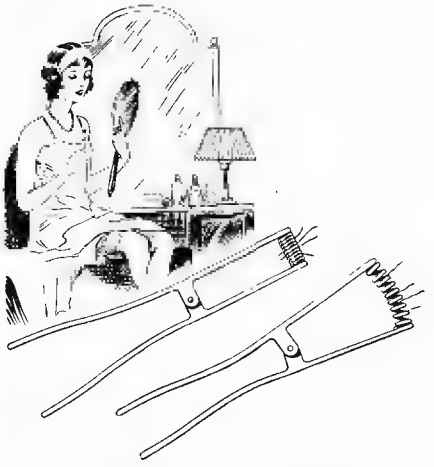
Notice to Readers:

AN appreciable period of time elapses between the filing of a patent and the date upon which the patent is granted. During this interval inventors frequently move. We regret that it is quite impossible for us to supply the correct addresses of persons whose inventions appear on this page, nor can we furnish information about when the product may appear on the market. Attorneys who prosecuted the patent cases can furnish the most reliable data. Copies of patents are available at ten cents each from the U. S. Patent Office, Washington, D. C.

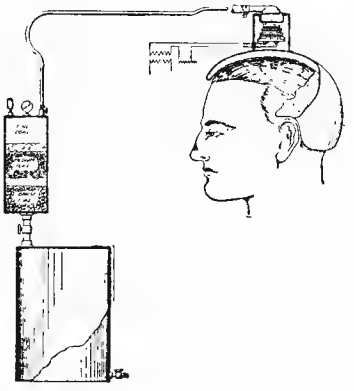
Science Grasps the Elusive Hair



No. 1,743,590, issued to Matilde Binz. This invention relates to improvements in devices for pulling or removing hairs from the skin of the face, head, scalp, or other portions of the human anatomy. It consists of a pair of operating elements pivoted at the center and with a steel tensile spring at one extremity.

Dry Your Hair

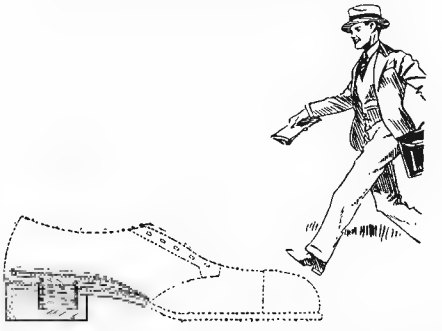
No. 1,747,342, issued to Harry P. Adams. Relates to improving ways and means of drying hair. The apparatus consists of a helmet comprising an inner and an outer wall with a chamber between. The inner wall is so formed as to discharge gas into the chamber, which is in immediate contact with the scalp. A heating means is arranged between the outer wall and the chamber so as to warm the gas and supply it to the chamber.



Propelling the Ship Faster

No. 1,743,508, issued to Rerad Wiernikowski. The object of this invention is to provide a device for increasing the driving power of the propeller. This is accomplished by sending a body of water under pressure against the propellers. The invention consists of a pair of tubes imbedded in the keel of the ship. The inlets of these tubes project at both sides of the ship in order to break the water resistance. The propellers are located directly behind the rear outlets of the tubes. The pressure of the water issuing from the outlets is controlled by the speed of the vessel.

Putting the Spring in the Shoe



No. 1,746,069, issued to Joseph Butzen. The idea of this invention is to create a device to help relieve the shock experienced when walking. The invention consists of a shoe with a depression in it extending from the floor of the shoe into the heel. Within this depression is contained a spring or resilient member, clamped into the depression and protected from the heel by the inner sole. The shock experienced on the heel is absorbed by the resilient member as the shoe is lifted and placed on the ground.

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"Hocus Pocus!" Cried the Ancient Medicos

(*Continued from page 298*)

a beetle in both hands and throw it over the left shoulder without looking back. Remedy intestinal trouble by eating mulberries picked with the thumb and ring finger of the left hand. If old age is coming too soon drink water drawn silently *down stream* from a brook before dawn. Peel the bark of slippery elm *down* if you wish to draw a cold down out of your head, but peel the bark *upward* if you desire to bring that cold up out of your chest.

Then, too, the patient might cure himself by transferring his disease to a bird or small animal by pressing the creature against the ailing part and hastily driving the bird or beast away. Certainly it was well known that the family dog might bear off the disease if fed a cake made of barley meal and the sick man's saliva. Your old-time Anglo-Saxon doctor could cure any child by making him crawl through a hole in a tree—the rim of the hole, of course, taking to itself all the germs or demons during the passage. Then, too, how easy to cure a small sore or abolish a wart by stealing a piece of meat, rubbing the spot with it, and then burying the meat; as the meat decayed the sore or wart vanished. The ancient Celts tried the more scientific method of making a waxen image of the ailing section or organ and melting it before the fire. Perhaps it is the same theory that induces the Mexican Indian even yet to compose a tallow image of his enemy and slowly melt it—the idea being that his foe "fades away" with the image.

Psalms and Pepper Corns

Now, some bodily complaints demanded far more intricate treatment. Stubborn, for instance, was the demon that caused inflammation; he required a precise ritual. Therefore, dig a sorrel plant, sing three paternosters, pull up the plant, sing *"Sed libera nos a male,"* pound five slices of the plant with seven pepper corns, chant the psalm *"Miserc mei, Deus"* twelve times, sing *"Gloria in excelsis, Deo,"* recite another paternoster, at daybreak add wine to the plant and pepper corns, face the east at mid-morning, make the sign of the cross, turn from the east to the south to the west, and then drink the mixture!

Did those ancient doctors cure? Probably they did. For faith and suggestion go a long way in the practice of the medical profession, and your old-time doctor, and his patient too, had a world of faith and used a world of suggestion. It is doubtful, anyway, whether the procedures and rites of those days long gone did any real harm, and they were certainly inexpensive—which is more than may be said for nine-tenths of the nostrums advertised daily in the newspapers of our enlightened era.

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Another Big Traffic Pipe

(*Continued from page 316*)

per hour in each direction, deemed ample to care for traffic requirements at this point for some time. Only automobiles and trucks will be allowed to use the tube.

This is the third important under-water roadway to be constructed in the United States. The other two are the great Holland Tunnel in New York and the George A. Posey tube at Alameda, California. The Detroit job presents radically different engineering problems from either of the others.

Among the most interesting departures from accepted practices on the Detroit job was the use of steel lining for the shield-driven segments on both sides of the river. Cast iron hitherto has been the favorite material for this kind of work. The use of steel on the Detroit undertaking resulted not only in a better lining, according to the engineers, but a marked economy as well.

The reason for the lowered costs is found in the greater strength of the steel lining per unit of weight. A complete "ring" of steel lining, of the lighter of two types used, weighs 5.61 tons. A ring of the heavier weight lining, used in the lower reaches of the tube, weighed 5.8725 tons. Cast iron lining would have run about three times as heavy as the steel, resulting in a higher cost of material much more difficult to handle.

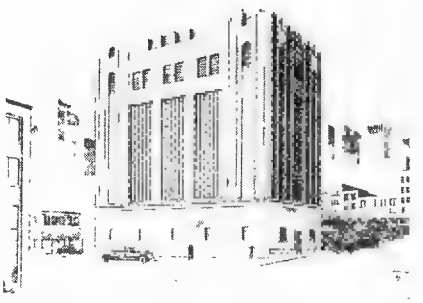
Digging this portion of the tube was a Herculean task. The shield used was the largest ever constructed in North America, although a larger apparatus now is being used in building the tunnel under the Mersey River at Liverpool. The American shield has an outside diameter of 32 feet, three inches.

The sandhogs cut away the earth in front of the shield with small powered knives.

About 1,700 feet of the whole tunnel are being excavated in this fashion. A total of 466 feet was done on the American side, while the Canadian boring will run about 1,220 feet.

Several innovations were incorporated into the procedure in connection with the river portion of the Detroit tunnel. The shield was used adjacent to the water at each end, extending out under the river for but a short distance. The stretch between—embracing almost the whole width of the Detroit River—was built by means of huge steel tubes, built five miles away.

There are nine of these tubes, all of which will be at the bottom of the river when this appears in print. They were built at the Canadian Steel Corp. plant in Ojibway, Ontario, down river from Detroit. Each tube was built on land, bulkheaded, launched like a ship and towed into position. Tubes were partially concreted after launching. Additional concrete then was added where the tube was to be sunk.



One of the ventilating buildings for the Detroit-Canada tunnel.

The tubes, it must be understood, lie in a V-shaped trench excavated some 35 feet deep into the river bottom. The sand and gravel fill was poured down a pipe, then leveled off by means of a unique craft specially designed for this work.

The tubes also were sunk in a somewhat unusual fashion. The steel tubes for the Michigan Central Railroad tunnel in Detroit were sunk by the admission of water to the interior of the tube. The same is true of the reinforced concrete tubes of the Posey tunnel. Tubes of the Detroit and Canada Tunnel, however, were sunk purely from their own weight, without the use of any interior ballast.

In the fabrication of the tubes at Ojibway, another pioneering procedure was initiated in the large-scale use of welding. All seams in the tubes were electrically welded, calling for more than a mile of welding on each tube. The nine tubes vary in length from 220 to 248 feet, with an over-all diameter of 35 feet. Each weighed about 500 tons when launched, increased to some 8,000 tons when concreted for sinking.

Produce Color and Light

(*Continued from page 333*)

of a saturated solution of common salt in water. When a current is passed chlorine is liberated at the anode and passes out the top of the lamp chimney. At the cathode hydrogen gas is liberated and a solution of sodium hydroxide is formed.

Chemi-luminescence is the term given to chemical reactions accompanied by the emission of light. Here is an interesting experiment for the amateur to perform. An evaporating dish is placed in crushed ice. A layer of mercury about 1 cm. thick is placed in the dish and connected to the positive pole of a battery. The wire must be insulated by a glass tube extending into the mercury. A platinum foil dipping in a 25 per cent solution of potassium bromide covering the mercury forms the cathode. Pass a current of 1.5 amperes. The mercury becomes coated with a film of bromide and glows with a brilliant orange light for several minutes.

On rapidly adding fifty cc. of a 30 percent hydrogen peroxide solution to a mixture of 35 cc. of 50 percent potassium carbonate solution, 35 cc. of a ten percent pyrogallol solution, and 35 cc. of a 35 percent formaldehyde solution a reddish glow appears during the reaction.

AN OMISSION

Due to an oversight, we failed to mention that the photographs used to illustrate the article, "Foods That Fight Your Stomach," in the May issue, were obtained in the Arthritis Clinic of Flower Hospital, New York. We are pleased to acknowledge this courtesy.

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Caged Motors

(*Continued from page 304*)

nine-tenths of the rated horsepower.

During the test not more than three forced stops shall be allowed. A penalty run of two hours will be added to any period in which a forced stop is made. If the speed during a propeller-load run drops to less than 94 per cent of rated speed, or the power in a dynamometer run drops as much as ten per cent, this shall constitute a forced stop. Excessive water, fuel, or oil leaks developing at the engine shall constitute forced stops. In all cases the Department of Commerce shall be the judge as to what constitutes a forced stop.

Minor repairs and replacements may be made between test periods if suitable tools and parts are available, but the test schedule shall not be delayed on this account. The failure of a major part of the engine shall terminate the test.

Each engine tested by the department is either (1) approved, or (2) approved provided minor improvements are made, or (3) rejected with the recommendation that certain changes be made before the engine is again submitted for test. At the completion of the block test a complete tear-down and detailed inspection of engine parts are made to determine excessive wear or signs of failure.

The report of tear-down inspection includes detailed measurements for all main journals; of crank pins on all cylinders; of all main bearings; of all connecting rod bearings; of the piston pins and bushings; of the top and bottom skirt cylinder dimensions (including maximum out of round and maximum taper); of piston dimensions (thrust and 90 degrees to thrust); of top and bottom skirt piston clearance; of intake and exhaust valve leakage; and remarks as to the condition of thrust bearing; cylinders, pistons, spark plugs, rocker arms, magnetos, camshaft bearings and gears, carburetor, and miscellaneous items.

During the past two years the testing of commercial aircraft engine types to determine their suitability for use in licensed aircraft has been carried on very actively. Tests were made on forty-six engines of which number twenty failed, five were withdrawn, three are still under test, and twenty-three have been approved or recommended for approval. Of the twenty unsuccessful engines, only fourteen completed half of the endurance test, and five failed in the first period.

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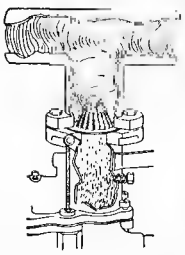

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Where Atom Meets Atom

(*Continued from page 309*)

atomic hydrogen—that is, hydrogen gas in which the molecule contains but one atom—in large quantities. The process might be represented as $H_2 = H + H$. These monatomic molecules quickly return to the normal state of H_2, and the hydrogen, in thus combining with itself to produce the H_2 molecules, gives off tremendous amounts of heat. A great deal of energy is needed to make H_2 change to $H+H$, and when the two atoms recombine, all this energy is liberated as heat.

In the process of producing this result a powerful electric arc is sent between two tungsten metal electrodes, and through this arc a stream of hydrogen gas is blown. As the energy of the arc is absorbed by the hydrogen molecules, they become single atoms, and are pushed out of the arc by the incoming gas. Once out of the influence of the arc, they try to recombine, and the energy they have absorbed is released in a brilliant red flame of hydrogen burning hydrogen. This flame is not more than a few inches from the arc itself, and the gas has already been superheated by the arc. The resulting temperature is extremely high. The atomic hydrogen flame thus formed is the only one which will melt metallic tungsten—a process requiring a heat of 3,500 degrees cent.—while the oxy-acetylene torch reaches a temperature of about 2,700 degrees cent.

Does Not Injure Metal

Atomic hydrogen has the curious property of melting metals more readily than non-metallic substances, for metals catalyze the reaction which produces the heat. But the greatest advantages of the new flame lie not in its high temperatures but in its unique constitution. Hydrogen in no way affects iron alloys. The atomic hydrogen flame is perhaps the most powerful reducing agent known, and will remove the least trace of oxides, without affecting the constitution of the metals or the alloys to be welded. Further, atomic hydrogen recombines after producing its heat, and forms an atmosphere of hydrogen gas which not only keeps the air away from the weld, but pre-heats and more gradually cools the metal, annealing the weld, in effect, as it burns with the oxygen of the air outside the field of action. The resultant weld is free from nitrogen, oxygen, or carbon, and is very ductile and strong. Its commercial reliability is demonstrated in the success of the General Electric Refrigerator, which is welded by this method throughout.

As interesting as the commercial applications are the unique properties of the atomic hydrogen. It will burn with itself, supporting its own "combustion." It is by far the lightest gas known, for it is about one-quarter as heavy as helium, and half as heavy as ordinary hydrogen. It gives off more energy per gram of weight, in burning, than does any other known substance, one gram of atomic hydrogen, burning with another gram, releases nearly 100,000 calories, which represents approximately 50,000 calories per gram. The oxy-acetylene flame gives only 3,000 calories per gram!

But with its many advantages comes a certain penalty, it combines the advantages of gas-welding with those of arc-welding, but also costs more than either. There is current to pay for as well as hydrogen gas to buy, and, into the bargain, the tungesten electrodes are not cheap, and there is a considerable investment in the electrical apparatus that goes with it.

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What To Do When Your Outboard Balks

(Continued from page 307)

the wire to one of the spark plugs and place the disconnected terminal against the water jacket of the opposite cylinder by inserting it between the pipe and jacket so a double contact is made on that cylinder. One through the plug and the other through the cylinder wall. Now apply the starting rope and get another surprise. Your motor will fire on the one cylinder ninety-nine times out of a hundred! Let it run for a minute or so, connect the other cylinder, and everything will be rosy!

Spark plug troubles will not annoy you much except in the high-powered racing jobs when running at reduced r.p.m. with retarded spark. Of course, it is necessary to have the proper plug in the proper motor. But nearly every manufacturer of spark plugs makes reliable and dependable plugs for all motors.

However, running at low speeds sometimes causes the plug to load up with oil and cut off proper sparking. This can be stopped by using an extremely short-shanked plug of the airplane type and by gunning your motor as soon as it starts, and then not running slowly with a racing job except for a few moments at a time. However, removing the plugs and wiping them dry will generally suffice. Extra plugs will save many a race or day's outing, though, as cracked porcelain, and other minor accidents are bound to occur occasionally.

Should your motor become suddenly hot, and freeze completely, look for the following things. Dirt or other foreign matter may have been sucked into the water intake; a cylinder may have become scored and overheated due to faulty lubrication; or you may be trying to push too heavy a load with a small propeller. In any case you have nothing to do but wait half an hour until the motor cools, check up on the cooling and lubricating systems, and proceed, keeping a close watch to see that your motor does not re-freeze. It also is well to examine piston rings, making sure they are free at all times.

Faulty Lubrication

Faulty lubrication in a two-cycle motor generally means too little oil. It is always better in new motors to go a little heavy on oil, say a half-pint more to the gallon of gas than the instructions call for. This will sometimes cause fouling of plugs in the high speed types, but with a little care in starting and running at low speeds you will soon become accustomed to your own engine and rarely have trouble.

Should a cylinder or piston become scored, don't try to smooth it down; get a new one. The cost is small and by proper breaking-in you will avoid the possibility of re-scoring, which often happens when the old one is not perfectly honed before reinsertion in the motor.

If your motor suddenly starts to race and motion stops, you have done one of two things—sheared a pin in the propeller or broken a shaft. The pin takes but a few moments to replace, but if you find upon examination that the pin is intact, paddle or row home and don't attempt to start the engine until it has been taken down, as every turn of the shaft will only cause more trouble after the shaft has been broken.

If your motor backfires into the carburetor, you have too lean a mixture or there is water in the gasoline. A quick look at the bottom of the carburetor (remove the screw and washer at the bottom of the bowl for a rapid inspection) or a few experimental turns on the needle valve will set you right in this case.

Too rich a mixture will often cause a motor to "four-cycle." This is a term applied when the engine seems to miss every other stroke and run at from 300 to 600 r.p.m., quite regardless of the position of the needle valve or gasoline feed petcock. Here, again, if you repeat the disconnecting process described in the ninth paragraph, one cylinder will be cleaned out, and the other will be burned clean by degrees when the plug is reconnected. This usually takes from two to four minutes of running.

Freezing of Lower Unit

Occasionally a lower unit will freeze. This, of course, is due to breakage of a part, or carelessness in keeping the lower unit properly lubricated. In racing jobs, it is a good idea to fill the lower housing with a good grade of grease every time the motor is used. If a few more revolutions are desired, pure vaseline will suffice, provided the housing is water tight, but great care should be used to replace such light grease after the motor has been used from one to two hours. Service motors can be run from ten to fifty hours or even more on a lower housing of grease, but grease is cheap and a word to the wise should suffice.

Make it a practice, whenever returning from a race or pleasure trip, to take the set of wrenches supplied with every motor and thoroughly go over all joints and connections, tightening wherever there is the slightest indication of nipples, elbows, joints or nuts and screws coming loose from vibration. Many a day has been spoiled and many a big race lost because a screw or a nut came loose at the wrong time.

Use any good grade of standard gasoline and oil. Ethyl gas when properly mixed can be used with safety, though a little heavier oil should be used to make up for the ethyl fluid's cutting oil molecules. Beware of new fuel mixtures containing ether, naphthalene, camphor, alcohol, and so forth. All that has ever been accomplished with these concoctions is a flock of melted pistons and cylinders and other unwelcome catastrophes.

Bear in mind the fact that your outboard engine turns twice as fast as the average automobile motor and three to four times faster than the average airplane motor, while it does not weigh a fraction of either, and that it has by far fewer working parts and delivers more power per pound than either—by at least 50 per cent! Use a few precautions. Stop and think before making untried experiments, or before starting to work with wrench, hammer or what not, and you will become more "sold" on your dependable, reliable, and economical "Buddy," the outboard motor, than you have ever been on any other piece of mechanical joy and convenience.

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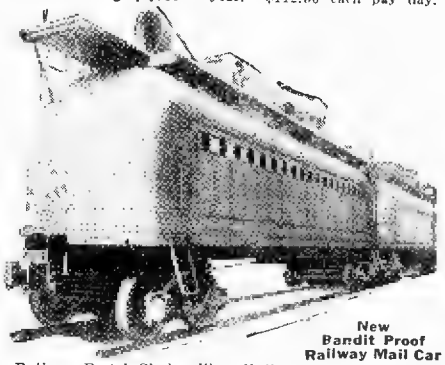

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The Truth About Sea Serpents

(*Continued from page 299*)

cared to examine the 'sea serpent,' as we did, and could easily have mistaken the illusion for the real thing.

"My personal belief, however, is that the 'sea serpents' most people see are really giant squids, a species of mollusk belonging to the family of cephalopods which includes also the giant octopus.

"The great squid is the only known animal whose arms can, without distortion, assume a serpentine form. There is an authentic record of one specimen that had a body eighteen feet long and two arms, or tentacles, approximately sixty feet in length. The other arms, about eight in number, were considerably shorter. Floating near the surface of the water, with its two long arms extended, this monster could be mistaken very easily for a sea serpent over one hundred feet in length.

"The ends of the arms are expanded and studded with suckers, giving the appearance of a bearded or maned head such as legend has attributed to the sea serpent. Certainly enough basis would be afforded in a brief glimpse of this animal, perhaps at some distance, to encourage an untrained person to supply enough detail from his imagination to create a kraken or horven."

Further supporting the scientist's explanation is the fact that the known distribution of giant squids practically coincides with the regions from which sea serpent stories have come. They haunt the North Atlantic and sometimes drift as far south as Florida.

Strange as it may seem, in view of the amused suspicion that attaches, in latter days, to those who spin sea serpent yarns, some of the most vivid descriptions of this fabulous creature have been handed down by ministers. The Rt. Rev. Erich Pontoppidan, Bishop of Bergen and a member of the Royal Academy of Sciences at Copenhagen, recounts in his Natural History of Norway, published in London in 1755, one such lurid encounter with the kraken. Dr. Bartsch unearthed the story during the course of his extensive studies of the sea serpent menace.

The good Bishop, in his narrative, hastens to point out that he himself was not favored with the vision but borrows the description from the Rev. Mr. Egede's "Journal of the Greenland Mission."

"On the 6th of July, 1734," wrote Mr. Egede, "there appeared a very large and frightful monster, which raised itself so high out of the water that its head reached over our maintop. It had a sharp snout and spouted water like a whale, and very broad paws. The body seemed to be covered with scales and the skin was uneven and wrinkled and the lower part was formed like a snake. After some time the creature turned its tail up above the surface, a whole ship's length from the head. The following evening we had very bad weather."

Listen to the Bishop

To which the Bishop adds the following supplements and conjectures:

"The drawing annexed gives me the greatest reason to conclude, what by other accounts I have thought probable, that there are sea snakes, like other fish, of different sorts. That which Mr. Egede saw, and probably all those who sailed with him, had under its body two flaps, or perhaps two broad fins; the head was longer and the body thicker and much shorter than those sea snakes of which I have had the most consistent accounts. Though one cannot have an opportunity of taking the exact dimensions of this creature, yet all that have seen it are unanimous in affirming, as far as they can judge at a distance, that it appears to be the length of a cable, that is one hundred fathoms, or six hundred English feet; that it lies on the surface of the water in many folds and that there are, in a line with the head, some small parts of the back to be seen above the surface of the water when it moves or bends.

"These at a distance appear like so many casks or hogsheads floating in a line, with a considerable distance between each of them. Mr. Tuchsen, of Herroe, is the only person of the many correspondents I have, that informs me he has observed the difference between the body and tail of this creature as to thickness. It appears that this creature does not taper gradually to a point, but that the body, which looks as big as two hogsheads, grows remarkably small just where the tail begins.

"The head in all kinds has a high and broad forehead, but in some a pointed snout, though in others that is flat, like that of a cow or a horse, with large nostrils, and several stiff hairs standing out on each side like whiskers. It is supposed that the sea snakes have a very quick smell; they are observed to fly from the smell of castor. Upon this account, those that go out on Stor-Eggen to fish in the summer, always provide themselves with these animals (beavers)."

Bishop Pontoppidan concludes by adding that Mr. Egede's description is the only one which mentions that such monsters spout water out of their nostrils "like a whale."

A Horror of the Deep

This account sounds like a fantastic night mare but, barring the "one hundred fathom length," Dr. Bartsch finds that the description tallies reasonably well with that of the giant squid. The squid, according to the scientist's description, has a body enveloped in a long soft mantle with its shell embedded in the dorsal part. The head is sharply differentiated from the rest of the body and surrounded by eight or ten arms, or feet, bearing suckers, two of these being of enormous length in proportion to the body. It is this circle of arms that gives the squid and octopus the name Cephalopod, meaning head-footed.

The mouth of the squid is situated in the middle of the tentacular disk. It is equipped with formidable jaws, resembling, says Dr. Bartsch, the beak of a parrot; on either side of the head huge eyes are situated, which in a large specimen may measure seven by nine inches, as large, let us say, as a "couple of pewter plates." Behind the head, in a constricted neck, is a siphon, through which water is expelled rapidly. This siphon is the squid's chief organ of locomotion. Sudden contraction of the muscular mantle expels the water and motion results. An ink bag, containing a dark fluid—the India ink of commerce—further equips this remarkable sea beast against its enemies. A discharge of the fluid in times of danger serves as a blind similar to the smoke screens bootleggers use to facilitate a getaway.

The Rev. Mr. Egede, Dr. Bartsch believes, mistook the tail of such an animal for the head of the serpent and the flukes for limbs, a mistake that other observers up to the present day no doubt have also made.

Another writer has described a Norwegian sea snake eighty feet long, but no thicker than a child's arm. Assuming that the observer saw the tentacles of a squid, Dr. Bartsch finds the description plausible.

According to the tale of one old seaman the "kraken" was of such generous proportions that it could disrupt the operations of twenty or more fishing smacks by its sub-sea maneuvers. Water of a known depth, varying from eighty to one hundred fathoms, on certain hot summer days suddenly decreased to twenty or thirty, runs the yarn, indicating to fishermen that the kraken was at the bottom. If the depth of the water began to decrease still more they knew that the kraken was raising itself and customarily fled the spot. Then a few minutes later the monster would come to the surface, though it was never seen in its entirety.

A glimpse afforded this remarkable description:

"Its upper part, or back, which seems to be in appearance about an English mile and a half in circumference—some say more, but I choose the least for greater certainty—looks at first like a number of small islands surrounded by something that floats and fluctuates like sea weeds. Here and there a larger rising is observed like sand banks on which various kinds of small fishes are seen leaping about.

"At last several bright points of horns appear, which grow thicker and thicker the higher they rise above the surface of the water, and sometimes they stand as high and as large as the masts of middle-sized vessels. It seems these are the creature's arms, and, it is said, if they were to lay hold of the largest man-of-war they could pull it down to the bottom. After the monster has been on the surface of the water a short time it begins slowly to sink again, and then the danger is as great as before because the sudden motion causes such a swell in the sea and such an eddy or whirlpool that it draws everything down with it."

There are numerous accounts of giant squids and octopuses—and science records an octopus with a tentacle spread of more than one hundred and twenty feet—attacking men and vessels. Dr. Bartsch does not believe that either beast would go out of its way to make such an attack, but says it is conceivable that, if the vessel ran over an animal of either species, it would strike out in self-defense and might upset a small vessel.

The record of one such encounter, which seems fairly well authenticated tells that two fishermen, out in small punts off Portugal Cove, Conception Bay, saw an object which they took to be a large sail, or debris from a wreck, floating in the water. Upon reaching it one of them struck at it with a gaff. The "debris," which turned out to be a giant squid, reared a parrot-like beak "as big as a six gallon keg" and struck at the bottom of the boat. Then it shot out two great livid arms and began to twine them about the craft. One of the men grabbed an axe and hacked off the arms and the creature disappeared. A part of one of the arms was immersed in alcohol and placed in the museum at Saint John's. It measured nineteen feet in length, was pale pink in color, pliant and very strong.

Make This Mixer

(*Continued from page 329*)

larger rings may be constructed. For general use, such as whipping cream, making mayonnaise, or mixing drinks, the rod described here will be very satisfactory.

The device used in attaching the rod to the motor shaft is a short length of round steel, drilled lengthwise to fit the mixing rod and motor shaft, drilled in the side and tapped for set screws to lock the rod to the motor and yet permit it to be changed for other equipment.

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Searching for the Essence of Madness

(*Continued from page* 300)

poison does not affect the fish for food purposes, the South American government forbids its use. However, the natives bootleg it extensively.

Specimens of the deadly strycnos bush were also procured. From this growth is derived the dread "curare," which is used to poison the tips of hunting arrows. A mere scratch from an arrowhead tipped with this poison means certain death to man or beast.

Many of the South American plant exhibits brought back to this country are utilized regularly by the natives of Brazil and Peru as medicines. The secret powers of these plants are closely guarded by the leading medicine men of the various Indian tribes.

All told, some 9,200 different kinds of plants were obtained by Dr. Killip and his associates. For each plant selected, three specimens were gathered. Each specimen consisted of a group of leaves, stems and berries—if any. Having been gathered, the specimens were placed between large pieces of blotting paper and bound, a dozen or more, to the bundle. These bundles were then dried out over a kerosene stove, covered with a bag so that they would retain their volatile properties. Whereupon they were ready for shipment home.

Native domestic habits in the remote jungles and mountain regions are very primitive, Dr. Killip says. On the highlands the inhabitants live mostly on potatoes and bananas, while in the lowlands the yucca, a species of potato, is the principal food. A curious fact is that transportation to high points may be achieved only on certain specified dates.

"We just couldn't bring ourselves to eat monkey meat," said Dr. Killip, of the food eaten by the expedition. "It is a great favorite among the native Indians, but we white folks couldn't stomach it because monkeys are too much like human beings and we had absolutely no cannibalistic tastes.

All the natives in one particular village visited by the scientists seemed to think it incumbent upon themselves to help gather plant and animal specimens. For a few pesos, scores of natives would be quite willing to cut their way through the densest jungles and climb the tallest trees. The accuracy with which they could pick out perfect flower specimens on a tree limb some 125 feet high, and bring the whole down with an arrow was marvelous.

The Indian medicinal plants gathered by the expedition will be studied by the American scientists with a view towards the establishment of a "jungle herbarium" in this country, which is expected to be of great value to medical science. The *ayahuasco*, in small quantities, is used by the natives for treating asthma, and the United States Department of Agriculture experts expect to test its use shortly.

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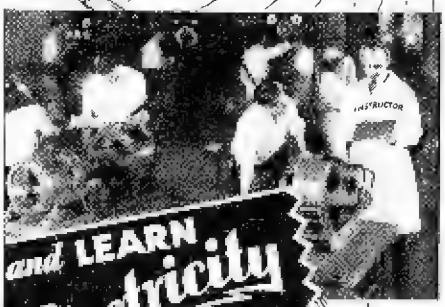

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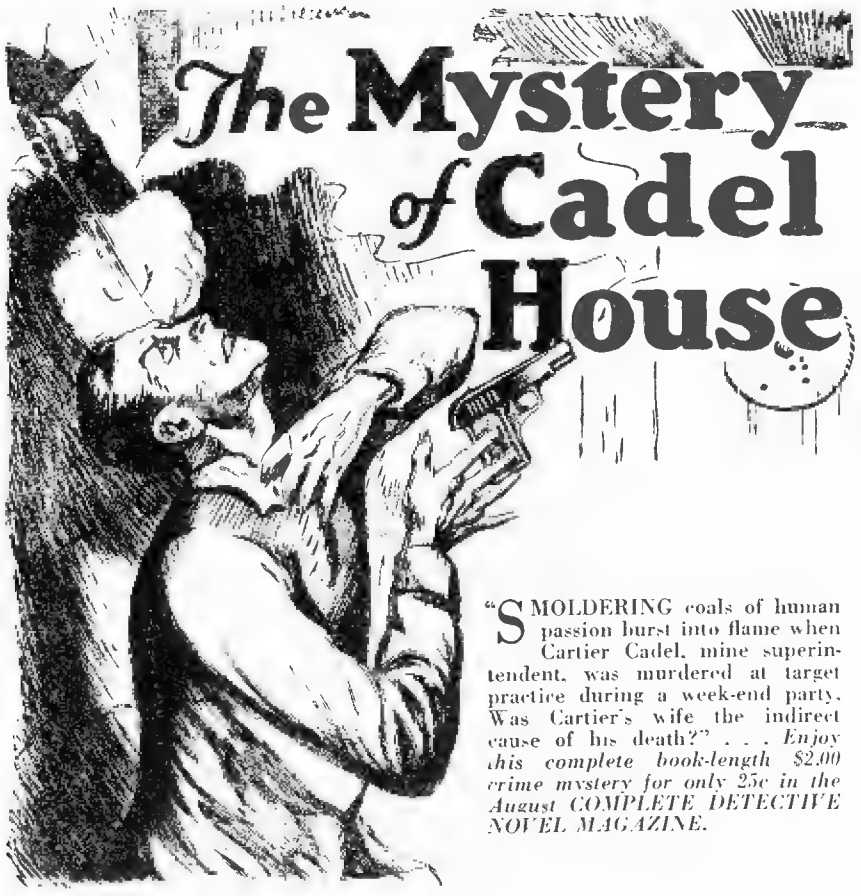

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How About an Etching?

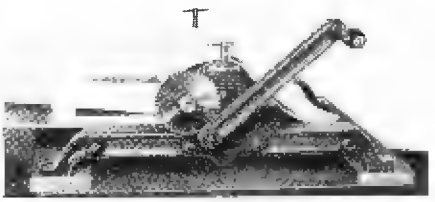
(*Continued from page 328*)

of a pencil, or anything with which you may work as you would a pencil. Be careful not to rub the ground with your hands, and follow the red lines of your transfer. Press hard enough to remove the wax as you make the line. While cautioned not to cut into the copper itself, it is better to scratch the surface too deeply than not deeply enough.

Nitric acid bites quickly and cuts a clean, vigorous line in the copper. A good preparation is one-third nitric to two-thirds water. This may be strengthened, as the acid becomes weakened through use.

Place the plate in a rubber or glass tray (acid will affect neither substance). Carefully pour the acid over the plate until the latter is thoroughly covered. You will note that all exposed surfaces will be covered with tiny green bubbles, an indication that the acid is working. After five minutes remove the plate from the acid. Exert the greatest caution not to get the acid on your clothing or on your skin for any length of time, for it gives a nasty stain. Hold the plate gently by the edges to permit the acid to run off, and then put it in a basin of water so that all surplus nitric acid is washed off. Remove, blot the plate dry and hold it up to the light. If the plate is bitten enough you will see the entire drawing, even the finest lines, etched upon the copper. Otherwise, put back in the bath and repeat for another minute or so. Then you are ready to ink the plate for reproduction.

Plates, before being inked, should be thoroughly cleaned. Turpentine poured on the ground and rubbed gently with the fingers will loosen the wax, and the plate should then be wiped clean with a dry rag. Alcohol removes the shellac on the back and sides, and a fine grade of emery paper may be used to bring back the polished surface.



Courtesy The Finken Press

Before printing, place a piece of felt on the paper, so that when you pass the roller over it the plate will not cut into the paper.

Now you are ready for the printing. Ordinary printing ink will do and this may be purchased at any print shop for a small cost. It is not easy to obtain a press, but the ordinary mangle or wringer will serve.

Rub the ink all over the plate. Now take a soft rag (cheese cloth is good) and wipe off the ink remaining on the surface. While you wipe the plate free of ink be sure to leave ink in the bitten lines.

Cut your paper to properly fit the plate with several inches margin. Then dampen it. Place face downward upon the inked surface and on top of this place a heavy piece of felt, so that the plate does not cut into the paper when put through the rollers of your press. Hold the plate with its paper and felt covering in one hand so that you may steady it as it passes through the wringer or press, which you turn with your other hand. As the plate and paper are passed between the rollers, the pressure forces the paper hard against the plate and the inked lines make their imprint (an etching) upon the paper.

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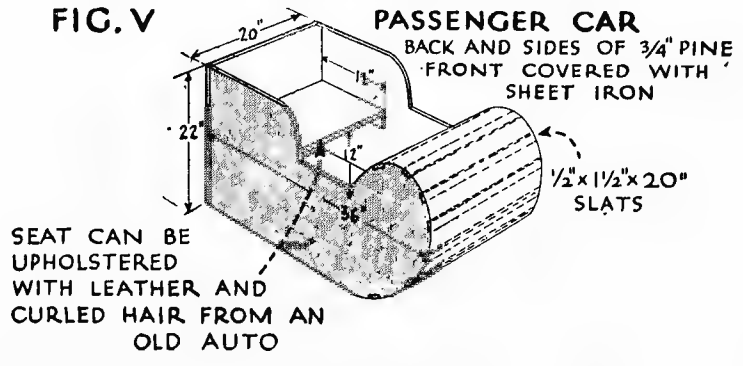
Give the Kids a Merry-Go-Round

(Continued from page 343)

Another operation before replacing the platform, is to mount a pulley on the under side of each 2"×4" piece 12" from the end. On two adjacent radial pieces, the pulleys are set 2" lower than the others by securing them to 2" blocks nailed to the under side of the 2"×4". The stakes and pulleys pertain to the driving gear of the merry-go-round, which will be explained in detail later.

for the driving rope.

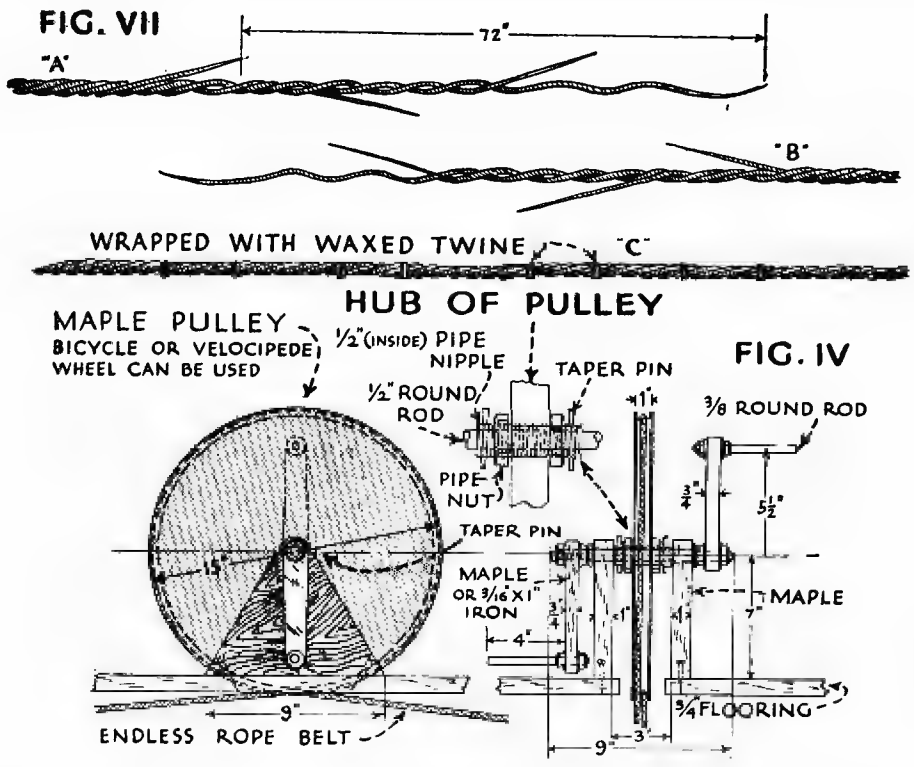
In any case, pedaling gear connected with a grooved pulley to receive ½" rope must be provided. Bicycle or velocipede wheels can be used in conjunction with horses, but if one has a home work-shop, it is a simple matter to make up the pedaling gear assembly shown in Fig. 4. The drawings and appended notes make the construction obvious. Three of these



The revolving platform can now be mounted permanently on the housing. First, the wheel bearings should be thoroughly greased.

The next operation is to mount the horses and the passenger cars. The acquisition of the horses may present quite a problem. Electric trains and automobiles have replaced rocking horses as kiddies' toys. However, some of one's friends may be able to locate an old rocking horse in the attic or store-room. While the assemblies are mounted on the platform. If old rocking horses are used, they are supported above the pedals. It is well that the distance from the seat to the pedals should vary on each assembly, so as to be adaptable to children of different sizes.

Fig. 5 illustrates the passenger cars which are placed between the horses. The design offered is really only a suggestion. Alteration can be made to suit the fancy of the builder.



horses add realism to the merry-go-round, their use is not essential to the mechanics of the machine. Old bicycles—even "velocipedes"—can be used instead. In fact, their use will do away with some of the special driving gear that is necessary when horses are used. The rim of a bicycle or velocipede wheel will serve as a pulley

What makes the merry-go-round go merrily around? A manually operated merry-go-round, built by a company on a production basis, undoubtedly would be designed to be driven through bevel gears to a big fixed ring gear at the center. Of course, such construction is beyond

(Continued on page 367)

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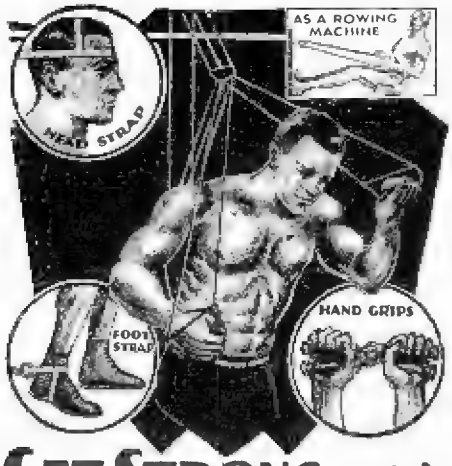

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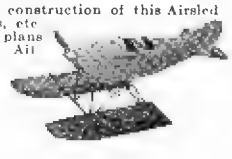

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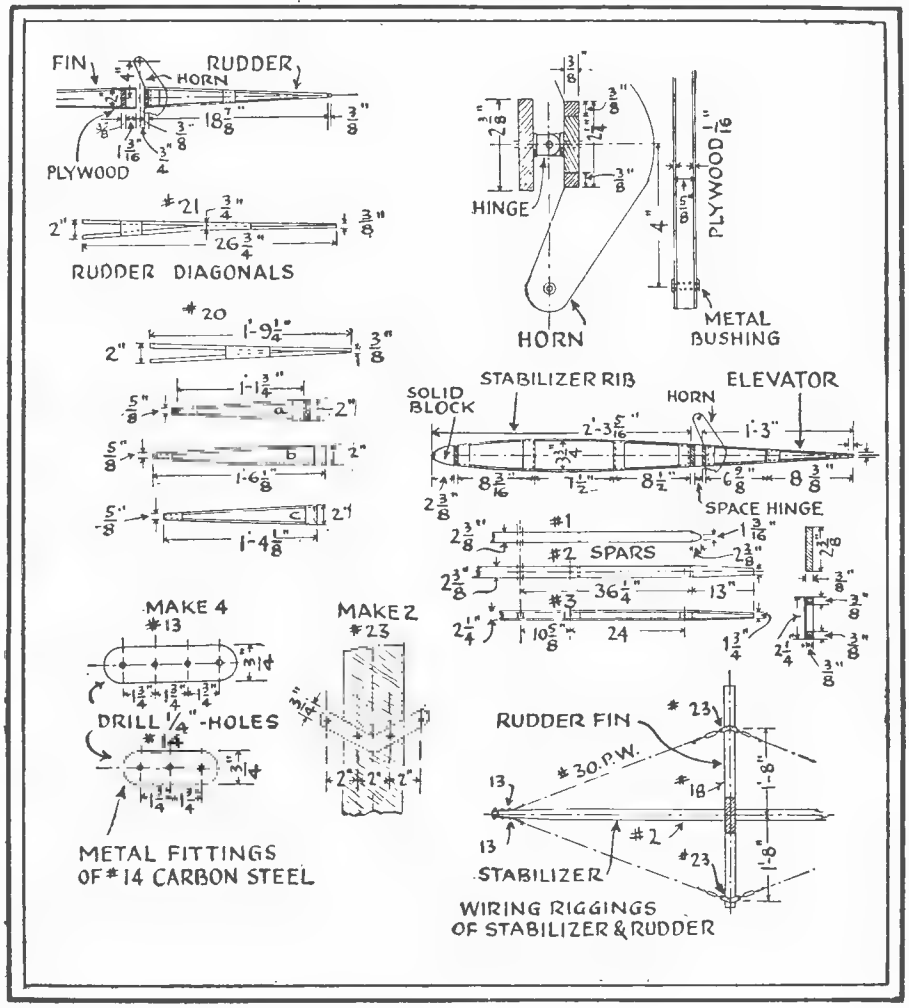
How to Build a SCOUT Secondary Glider

(*Continued from page* 311)

toes. The pivot for the rudderbar is provided by a long ½" wood lag screw. This wood lag screw should be long enough to extend well into the bottom spruce form member of the runner.

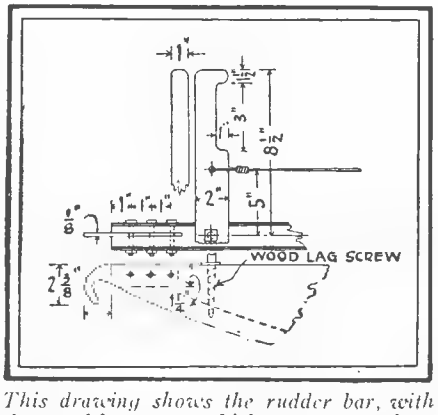
The cabane double pulley sheave bracket is next made from carbon steel. This bracket requires two 1¾" aluminum pulleys which can be purchased from the Heath Airplane Company, 1727 Sedwick St., Chicago, Ill., for 25c each. In cutting out the sheave bracket fit the aluminum pulleys so that they will rotate freely and independently. A groove is sawed in the bottom of the cabane for the mounting of this double pulley set and it is held by four ¼" machine bolts running through two on either side.

are glued between these top and bottom strips at the points where the elevator hinges are attached. The construction of the regular elevator ribs is shown in the side view of the elevator-stabilizer drawing. The diagonal braces No. 9 and No. 10 are shown in separate drawings. The ends of the elevator are solid spruce strips cut as shown in drawing No. 11. When the two elevator frameworks have been completed it is best to hold them in place against the back spar of the stabilizer to mark and mount the hinges. The hinges can be made in the same manner as the aileron hinges described in the wing construction data (July issue). It is advisable to buy factory-made hinges for this purpose; the Health Airplane Company



The stabilizer is next built. The front stabilizer spar No. 1 is spruce ⅜"×2⅜"×6'6". The back stabilizer spar No. 2 is spruce ⅜"×2⅜"×8' 2½". The form of the stabilizer ribs is clearly shown in the drawing. The regular eight stabilizer ribs are built up of ⅜"×⅜" spruce strips. The end stabilizer ribs are made of ½"×1¼" spruce strips. The long diagonal brace is built up as shown on figure No. 6 of ⅜"×⅜" spruce strips. The leading edge is plywood 1/32" securely glued and nailed in place. Triangular plywood gussets are used at the connecting points for strength and rigidity.

The elevators are built by first constructing a spar as shown in the drawing No. 3. The elevator spar is really two ⅜"×⅜" spruce strips held apart by a plywood webbing fastened to one side. Spruce blocks



This drawing shows the rudder bar, with the wood lag screw which serves as a pivot.

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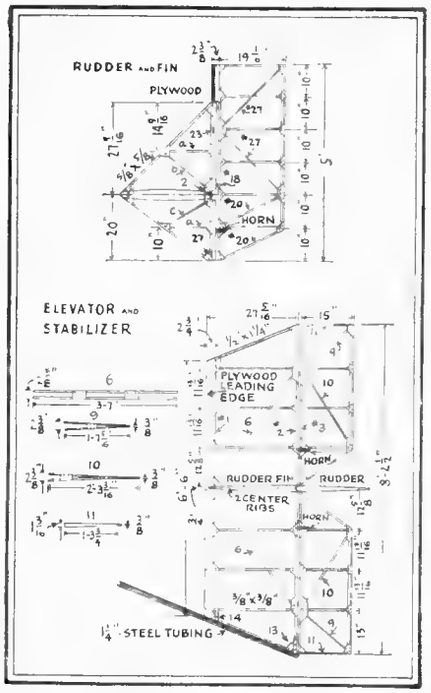
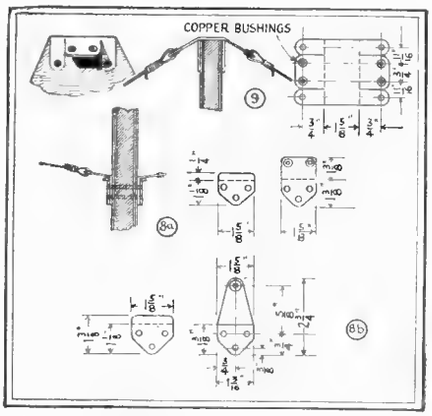
sells hinge bolts for 15c each. Each elevator has a horn mounted in position as shown in the drawing. The trailing edges are made in the same manner as the trailing edge in the main wing section described last month.



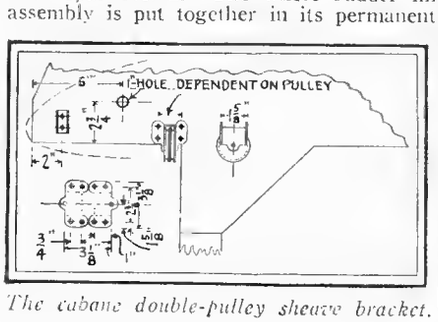
The rudder, fin, elevator, and stabilizer.

The rudder fin is built by first preparing a spar of spruce 3/8"×2"×3' 11-9/16". This spar is the main upright support for the fin and receives the three hinges which support the rudder. Prepare the smaller diagonal ribs a, b and c as shown in the



The pilon clamp and the front and rear flying wire clamps.

separate drawings. The leading edge of the fin is formed of a 5/8"×5/8" spruce strip which is slightly rounded on the outside edge. The metal fittings No. 13, No. 14 and No. 23 are made next and bolted to their places on the finspar and the stabilizer spar No. 2. The whole rudder fin assembly is put together in its permanent



The cabane double-pulley sheave bracket.

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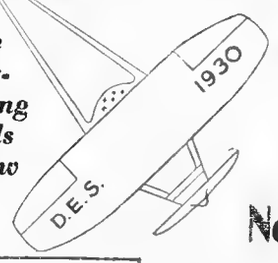

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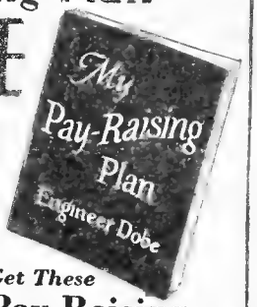

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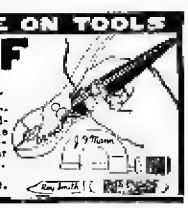

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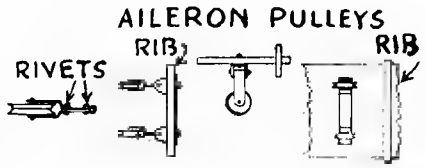
position vertically in the center of the stabilizer framework. Make strong joints by gluing in triangular blocks and plywood on both sides. No. 30 piano wire tightened by No. 324 S. F. airplane turnbuckles is installed as shown in the wire rigging drawing.

The rudder framework can be built up on the work bench. The spar is spruce ⅜"×2"×5' drilled to receive the rudder hinges and prepared for the mounting of the rudder horn. The diagonal brace ribs No. 20 and No. 21 as well as the regular rudder ribs are built up of ⅜" square spruce strips. The trailing edge of the rudder is built the same as the main wing trailing edge. The spar of the rudder fin is covered on both sides with a strip of plywood 4" wide. Wooden blocks are glued in between where the hinges are attached later on. This brings the rudder spar farther back and allows it to move freely in the hinges without hitting the elevator spar.



We now have the wings, fuselage and control surface framework.

The tailgroup will be held in position and connected to the center section by a forklike steel tubing frame. In the next article we will take up the construction of this framework, also the rigging and the control system.

List of Parts and Material

Pieces	Name	Nr.	Material	Size	Note
1	center section		spruce	24 feet—2¾x1⅜"	sanded
1	runner section		spruce	24 feet—1⅜x1⅜"	sanded
1	skid		ash	7 feet—2½x½"	
40	plywood cover		birch plywood	3/32" thick	
4	bulkheads for fuselage		spruce	50 feet ¼x½"	use 1/16" plywood
6	longerons for fuselage		spruce	90 feet ¾x½"	steamed to bend
1	nose cover		glaced cardboard	20 sq. ft.	varnish
1	rudder bar		ash	17"x1"x2"	put on toe straps
1	launching hook		carbon steel	5"x1¼"x⅛"	edges rounded
1	pilon clamp	9	carbon steel	3/32" thick	copper bushings
1	wire clamp (4 parts)	8a	carbon steel	3/32" thick	copper bushings
1	wire clamp (4 parts)	8b	carbon steel	3/32" thick	copper bushings
1	cabane sheave bracket		carbon steel	3/32" thick	
2	pulleys		aluminum	1¾"	
1	wood lag screw		iron	½" 4" long	
1	front stabilizer spar	1	spruce	6'6"x2⅜x⅜"	sanded
1	back stabilizer spar	2	spruce	8'2½"x2⅜x⅜"	sanded
8	regular stabilizer ribs		spruce	⅜x⅜"	1/16" plywood gussets
2	stabilizer end ribs		spruce	1¼x½"	solid
2	diagonal braces	6	spruce	⅜x⅜"	1/16" plywood gussets
1	elevator spar	3	spruce	⅜x⅜"	1/16" plywood gussets
6	elevator ribs		spruce	⅜x⅜"	1/16" plywood gussets
2	diagonal braces	9	spruce	⅜x⅜"	1/16" plywood gussets
2	diagonal braces	10	spruce	⅜x⅜"	1/16" plywood gussets
2	end ribs	11	spruce	⅜x1 3/16"	solid
7	hinges				
3	horns		spruce		plywood on each side
2	elevator trailing edges		spruce	⅜x⅜"	plywood on each side
1	rudder spar		spruce	5'x2"x⅜"	
6	rudder ribs		spruce	⅜x⅜"	1/16" plywood gussets
2	rudder diagonals	20	spruce	⅜x⅜"	1/16" plywood gussets
2	rudder diagonals	21	spruce	⅜x⅜"	1/16" plywood gussets
1	rudder trailing edge		spruce	⅜x⅜"	1/16" plywood gussets on both sides
1	rudder fin spar		spruce	3'11 9/16x2x⅜"	
4	rudder fin ribs—a, b, c		spruce	⅜x⅜"	1/16" plywood gussets
1	rudder fin leading edge		spruce	⅝x⅝"	outside edge rounded
2	plywood strips on rudder fin spar		birch	4" wide x 3'11 9/16"	glue blocks for hinges between
4	stabilizer support fittings	13	carbon steel	3 32" thick	
4	stabilizer support fittings	14	carbon steel	3 32" thick	
2	rudder fin support fittings	23	carbon steel	3 32" thick	
4	turnbuckles		airplane grade	No. 324 S.F.	
31	machine bolts and nuts		steel	¼"	use washers and lock
20'	bracing wire		piano wire	No. 30	nuts using center punch

The Man Who Rocks the Deep

(*Continued from page* 315)

Dr. Sperry is another use to which the principle of the spinning toy top has been adapted. The Japanese Navy has adopted the gyro stabilizer for many of its ships to maintain balance in heavy seas. Ships roll because of the accumulated impulses of a series of waves. A single wave can start the ship to rolling but it requires a succession of waves to make her pitch and toss. The inventor saw that suppressing the roll depended on counteracting the effect of each wave as it struck the ship, allowing no accumulation of wave force. The rush of a heavy sea against a ship is countered simultaneously by the opposing force of the gyroscope from the other side. The masts of a vessel equipped with the Sperry stabilizer remain absolutely vertical hour after hour in the midst of hurricanes and mountainous seas.

The opposite also is true. In calm water, by reversing the gyro stabilizer, one can cause a ship to rock and waves to rise.

The airplane industry was not long in discovering the gyroscope. It is used to operate apparatus in the navigation and manual flight of airplanes. Most recently it has been used to detect inaccuracies in railroad tracks, especially the cross level at curves, recording the condition of the rail at the instant it is under full pressure and the impact of speed. The Gary Medal of the American Iron and Steel Institute was presented to Dr. Sperry recently.

In *Toward Civilization*, an engineers' symposium edited by Charles A. Beard to which Dr. Sperry contributed an article on the Spirit of Invention, the scientist advises young inventors: "Remember that the first step in solving a problem is careful research into what other people have done along the same lines," he writes. "When you know their mistakes and have compared them with each other, you may have a starting point from which to begin your own deductions."

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A Collapsible Boat from Old Inner Tubes

(*Continued from page 330*)

too, is folded back on itself. The cross-sectional area of Figure 8 clearly shows how the folds are made.

The exposed surfaces of the folded back sections of the tubes are the surfaces to be cemented. These should be roughed up with a scratch-brush or sand paper and then be treated with two coats of good cement. When the cement is sufficiently "tacky"—the same as when patching a tube—one fold is rolled over the other, as shown in Figure 9. After waiting a few moments for the cement to set, the folds can be pulled off the cylindrical form, the slots turned in line, and the form removed from the tube.

With the tube complete, it is necessary only to place it within the canvas carcass and finish the sewing. The valve stem should be drawn through a small hole in the canvas, and be secured with a rubber washer and lock-nut.

The canvas must be waterproofed, but before doing this it is best to inflate the tube until the canvas is drawn tautly, then hose down the "boat" and let it dry out in the hot sun. Repeat this operation a number of times, and the canvas will shrink and conform to the shape of the tube. Nearly every wrinkle will be shrunk out. Next, the canvas should be thoroughly water-proofed, particularly at the seams. Various ready-prepared solutions on the market will be found very satisfactory, but one can make one's own preparation by mixing melted paraffin and gasoline in proportion 1 to 4. This is painted on while warm with a white-wash brush.

The best means of propelling this boat is with a double-bladed paddle. As said before, this is no speed craft, but, in its class, it will serve very well.

Give the Kids a Merry-Go-Round

(*Continued from page 363*)

the scope of the amateur builder. So a simple endless belt method is employed as shown in Fig. 6. The drawing is practically self-explanatory. The belt is made of ½" four-strand rope. The drawing shows how it passes around the stakes and pulleys. An idler pulley, attached to a stiff tension spring, takes up all the slack.

One thing that may puzzle the amateur builder is how to make a smooth splice in the rope. Fig. 7 explains. It is best, but not essential, to use four-strand "transmission" rope ½" in diameter. The drawings show how the ends are untwisted for about 6', each strand cut to a different length and tapered off, and then twisted together again. An expert rope splicer can make a joint that defies detection, and is as strong as the original rope. The amateur splicer, however, had better sew through and through the splice with a strong needle and shoemakers' twine.

It is a good idea to place 4" lengths of garden hose over the stakes driven in the ground. This will aid in preventing slippage of the driving rope.

How to Make a Rock Garden is the subject of an article by Hi Sibley scheduled for the September SCIENCE AND INVENTION. . . . Another H. L. Weatherby constructor article is booked for the same issue.

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A Power Scroll Saw

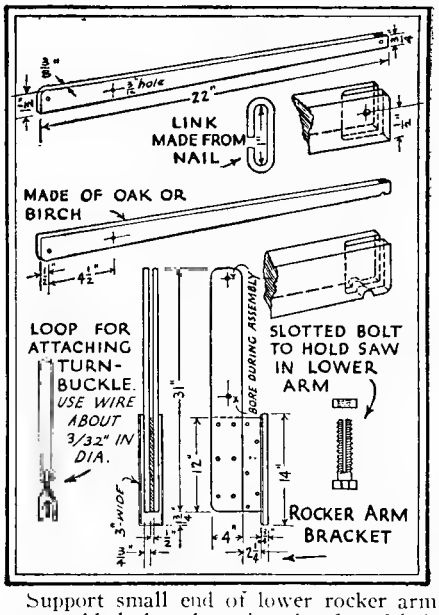
(*Continued from page 337*)

edge of the rocker arm groove where this bolt is secured till the saw blade has been trued up.

Success will depend largely upon selection of the sewing machine head. Local dealers accumulate various makes of old machines taken in on trade and—so I was told—are usually glad to get rid of them. Select one with as little play in the needle-post-cam as possible. The one I used was an old "Monarch" head. It will be noted from the photograph that the iron base was detachable. I took it off and screwed a hardwood base-block in its place for two reasons; first, because this block raised the needle post and gave the saw greater clearance; second because it made easy the fixing of the head to the saw table.

Once selected, the head should be stripped of everything except the flywheel, pulley, shaft, cam-wheel, cam, and needle-post. Make careful note of how the needle was held in place. You may find a better clamp for holding the saw than the one I made.

When this head is ready, attach the base block, and assemble the whole outfit. Glue and brad the wooden base block of the machine head to the veneer saw table. Be sure it is centered accurately. Bore a 3/16" hole thru the table top directly below the needle post, attach a saw blade to the post, and brad the table top to the post assembly—lightly at first, until all parts are fitted. Tack on the rocker arm bracket for fitting in the same temporary manner. Now the upper rocker arm. Attach link to top of needle post, and fit small end of rocker arm to link. Mark hole in bracket upright to correspond with the one in the rocker arm so that the pull on the link will be straight up. Bore to fit the bolt used. A 3/16" round head bolt, 2¼" long is suitable.


LINK MADE FROM NAIL
MADE OF OAK OR BIRCH
LOOP FOR ATTACHING TURN-BUCKLE. USE WIRE ABOUT 3/32" IN DIA.
SLOTTED BOLT TO HOLD SAW IN LOWER ARM
BORE DURING ASSEMBLY
ROCKER ARM BRACKET

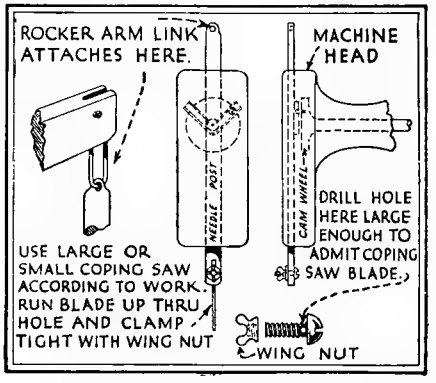
Support small end of lower rocker arm on saw blade loosely, using the slotted bolt and adjust this arm parallel to the top arm. Then bore lower hole in rocker arm bracket directly below the upper hole—assuming that the bracket is vertical.

Now attach the turnbuckle using two loops of fairly stiff wire. Screw buckle tight enough to put tension on saw blade. Turn flywheel slowly, adjust slotted bolt on lower arm to where the saw runs true. There must be no lateral, or shearing motion. Mark position of bolt on rocker arm, remove latter, and notch the arm with a rat tail file.

All set now. Fasten all parts permanently, saw table, rocker arm bracket, and rocker arms. Use nails on top, and screws on bracket base.

It may be necessary to attach two strips below saw table to guide the lower rocker arm.

The guide plate is made of high grade carbon steel. Drill a 3/16" hole in center for the saw, notch as shown, with a jeweler's file, and see that this notch is only deep enough to hold the backbone of the saw blade. The saw teeth must run free. Bore and countersink the screw holes, heat the metal to a cherry red, and temper in water so a file won't nick it. Now fit it into the table top, and try the saw in it a few times. Screw it in place, and the assembly is complete.


ROCKER ARM LINK ATTACHES HERE.
MACHINE HEAD
NEEDLE POST
CAM WHEEL
DRILL HOLE HERE LARGE ENOUGH TO ADMIT COPING SAW BLADE.
USE LARGE OR SMALL COPING SAW ACCORDING TO WORK. RUN BLADE UP THRU HOLE AND CLAMP TIGHT WITH WING NUT
WING NUT

Finish the job with orange shellac on saw table and rocker arms, and a very light gray enamel on the other parts. To make a blower for sawdust, attach a rubber bulb to machine head so that the upper rocker arm will press and release it. Use a small rubber tube to conduct the blast to the saw cut, and aim it at the junction of blade and cut in such a manner that the dust is blown away from the operator.

Experience will soon tell one what speed to run this saw at. Best results are obtained at a moderate speed—one just below the vibration point. With care this saw will cut pine or gumwood as thick as the thrust of the saw post will allow.

Putting Plants Through Their Paces

(*Continued from page 344*)

The holes should measure from about an inch to two inches in diameter and they may be separated from one another by about the same distance. Get some good soil with sand and, if possible, some leaf mold in it. As well have at hand a lot of broken crocks to arrange on the bottom of the big pot, so that there may be a free drainage of water. Then you may start to press in the soil, bringing it up to the first row of holes. Now insert some small ferns in the holes. These can be bought or, if you live in the country, dug up in the woods. All kinds do well, but for the holes you will naturally want rather small ones. When one row of holes has been planted, fill in more soil, and build the contents up in this way until the pot it full. Complete the planting by placing one or more larger ferns in the soil at the top of the pot. All you have to do now is to keep the fernery well watered and have it in a light window of a room. Soon the pot will be a mass of graceful greenery, and it will remain so indefinitely.

FORECAST

By the Official Forecaster

BEFORE we take off on our monthly observation tour—**The Padre of the Rains,** appearing in this issue, got an interesting reaction in process from the office next door . . . **Ernest Hopkins,** who forms fifty percent of the personnel there, remembered that he had dowered **Father Ricard** with this name in 1914, when he interviewed the priest astronomer for the San Francisco Bulletin. It was one of those happy lines, imaginative and affectionate, that we seem always to be groping for but can't find. It has been synonymous with Father Ricard ever since. . . . Another of Mr. Hopkins's lines that has stuck is the term **fastest human,** which he applied originally to Charley Paddock.

THE COUNTY FAIR is one of the great American institutions which many of us never get to see in action. . . . For September we have booked an article on **Uncle Sam** as an **entertainer** and **instructor** at the **County Fair;** and take it from us, he puts on a real act. . . . Somehow we grow up with the idea that instruction under government auspices is apt to be as useful and as dreary as statistics. This article proves that Uncle Sam can be humorous, ingenious, and enlightening, all at once.

CAN you tell a **toadstool** from a **mushroom?** The difference is a handy thing to know when you go looking for mushrooms.. . . **Dr. E. Bade** illuminates the subject in his usual graphic way for the September S. & I. He informs you how to tell the edible from the poisonous by the looks of the plant, and the only other method is to try it on your stomach, which isn't practical.

WITH the mercury at late summer temperatures, it's comforting sometimes to reflect that there's likely to be hotter places in the world than the one you're in. . . . We've corralled one of them, we guess, in a **story of exploration** that we intend to run next month. Of course if you're located in Yuma, you'll probably sneer when you see this article. To which possibility we reply, Well, what of it? Everybody enjoys a good sneer once in a while. Buy S. & I., and get a break either way.

A **TELEPHONE TABLE** of beautiful design, a **wood-box** that will make a friendly flanking piece for that fireplace, a **lamp of hammered and wrought design,** a **lap desk** for the school boy or girl—these are some of the **how-to-make-it** articles on tap for near future production. . . . **Chemistry, electricity, automotive, radio,** and other articles in the experiment and constructor alley are not lacking.

WE'RE GETTING ENTRIES for both the **contests** announced in June and July. In September we'll announce the **first flock of winners.** . . . If you're a handiworker you're wasting time every minute that you're not in on one or both of these contests. The conditions are available in this issue. Good idea to get in now.

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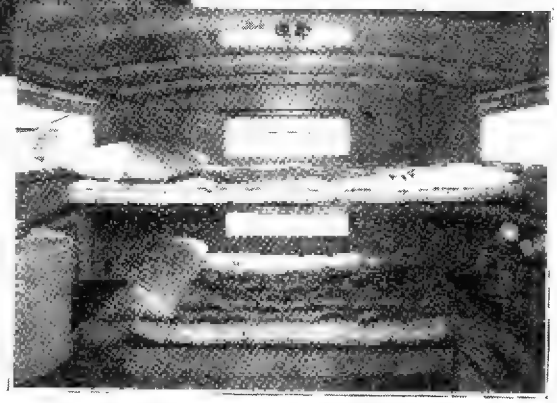
Roam in a Rolling Home



The Covered Wagon Company

IF you have a car and expect to go camping this summer, just attach a covered wagon to it. You will be able to travel in true nomad fashion, stop where and when you please, rest, cook your meals or go to sleep within a very few minutes, without setting up a tent.

The covered wagon weighs one-fourth as much as the average car, its manufacturer says, and is two inches wider. Its frame work is of hardwood built up on an angle-iron chassis. The sides are of masonite presdwood, an insulator which helps keep out excessive heat or cold. Universal coupling and tow-bars keep the trailer steady, even at the rate of fifty miles per hour, it is claimed. The rear door is weather-stripped and the wagon is said to be rain, dust and insect proof.

There are five glass windows with screens and waterproof roll shades. There are two wall beds with mattresses each 4 x 6 feet, to accommodate two adults each.

Its interior is arranged like a kitchenette apartment. By lowering the floor, adequate head space is provided, with sixteen square feet of kitchen. The doorways can be opened to the ground. An ice-box, a five-gallon water tank, electric light operating from a "hot-shot" battery, cupboards for dishes and pots, a closet for hanging clothes, a gasoline cooking stove (can be used for heating in cold weather), an oven, a fold-up table and two camp chairs are provided.

An antiseptic toilet can be furnished.

One-Piece Ships

ELECTRIC welding has made its way successfully into the field of ship construction. The first rivetless cargo vessel, a 2,500-barrel tanker fabricated entirely by the arc-welding method, has been launched by the Charleston (S. C.) Dry Dock and Machine Company.

Nine workmen only were employed in building the boat, and 8,000 pounds of welding wire were absorbed in the process, as compared with 85,000 pounds of rivets which would have been necessary had the vessel been fabricated by the riveting method.

A saving of twenty percent in weight and 25 percent in cost is believed to have been realized by the substitution of the arc-welding method.

The Electric Boat Company of Groton, Connecticut, also has launched an arc-welded vessel. It is of the barge type.

Charleston Dry Dock and Machine Co.

Lounge Cars Offer Comforts

THE Atchison, Topeka & Santa Fe Railroad regularly operates lounge cars of an elaborate type over its lines. On these cars everything is available, from the cold sudsy soda-fountain beverages preferred by the American citizen of average taste to shower baths and barber service for both sexes.

Putting in Glazier Points

PUTTING in the small triangular points, used to hold glass panes in place is a troublesome job, when the sash is in place above your head. It can be done easily by placing a small amount of putty on one face of each point and pressing to the glass. This will hold the point in place. You can do the job with gloves on.—*John A. Scott.*

The Boss Didn't Even Know My Name

"He said my face was more or less familiar and he remembered seeing me around, but he didn't even know my name until the I. C. S. wrote him that George Jackson had enrolled for a course of home study and was doing fine work.

"'Who's George Jackson?' he asked. Then he looked me up. Told me he was glad to see I was ambitious. Said he'd keep his eye on me.

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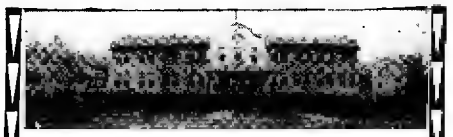

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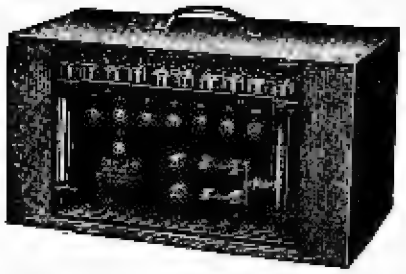

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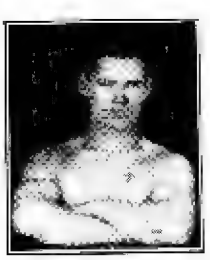

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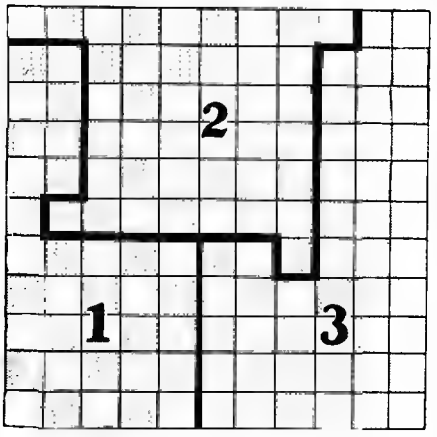
Answers and Prize Awards in April Puzzle Contest

By Sam Loyd

Solution to "Scissoring Linoleum"

The accompanying diagram illustrates how the 11 by 11 square may be constructed from three pieces produced by dissection of the linoleum remnant.



Solution to "The Game That Can't Be Beat"

The odds on horse A, 2 to 1, represent 33 1/3 per cent of the chances in the race. B's odds, 3 to 1, represent 25 per cent. C's odds, 4 to 1, represent 20 per cent. D's odds, 5 to 1, represent 16 2/3 per cent.

Thus in those four entries the bookmaker sells 95 per cent of the chances in the race. To make his 125 per cent book, he must now offer the fifth candidate, E, at the odds of 7 dollars against the bettor's 3, which represents 30 per cent.

To balance his book, theoretically, the bookmaker would take in $125 in bets on the five entries as follows:

66 2/3	against	33 1/3	on	A
75	"	25	"	B
80	"	20	"	C
83 1/3	"	16 2/3	"	D
70	"	30	"	E

Thus, no matter which horse wins, he pays out only 100 of the 125 dollars taken in.

Prize Winners in May Contest

First Prize, of $10, is awarded to:
Stewart Huey, 100 Ridgefield Ave., Waterbury, Conn.

Second Prize, of $5, is awarded to:
Theo. Kleinsasser, Alexandria, So. Dakota

The ten prizes, of $1 each, are awarded to the following:

Jos. C. Grandow, 5338 Carpenter St., Chicago, Ill.
E. J. Kinleyside, R. D. No. 3, Jefferson, O.
William Kaplan, 1957 No. 48 St., Merchantville, N. J.
Carleton Gamage, 9 Jewett St., Skowhegan, Me.
Samuel A. Sloan, 745 Chislett St., E. E. Pittsburgh, Pa.
Theodore F. Wilson, 5618 Calumet Ave., Apt. 2 East, Chicago, Ill.
S. Oswald Harries, Port Alberni, B. C., Canada
George Sargent, Apartado 238, Tampico, Mexico
Morris Fruchtman, 148 W. 74th St., New York City
Wm. H. Cruikshank, Hotel Lincoln, Duluth, Minn.

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A Tool Box and Work Bench

(Continued from page 329)

be cut to exact length after legs are in place. The drawer guides can also be cut at this time. They are also cut from the 2" x4" length, one piece of 2"x4"x20" being ripped to make two 2"x2"x20" pieces.

The lower shelf and the top boards are now cut to size. The shelf is made from the 2"x10"x6' piece, which is cut in half to make 2"x10"x36" pieces. The top is made from the 2"x12"x10' length. This is now cut into two lengths measuring 2"x12" x56" long.

All stock for the main bench has now been cut to size, and it is best to assemble them before proceeding with the work. First, nail the legs to the floor standards, and then attach the two 10"x36" pieces to the standards, forming the shelf. Now attach the drawer guides to the legs, after planing and sandpapering the side of the guides on which the drawer slides, or the guides may be well greased so that the drawer may slide back and forth more easily. The top of the bench is now nailed into place.

The drawer is of simple construction, being made of 1" white pine stock throughout. Take the 1"x5"x5'—8", and cut it into two lengths, 34" each, which will form the back of the drawer and one of the pieces necessary for the bottom. Mark one "back" and the other "bottom" in pencil and set aside.

The 1"x7"x12' piece of stock is now cut into the following lengths, two pieces, 19" long; one piece, 36" long, and two pieces, 34" long. These should be marked with pencil in the order named "sides," "front," and "bottom."

The drawer may now be made ready. Nails and hot carpenter's glue should be used for this purpose. If instructions have been followed, you should have the following pieces of cut lumber.

1 pc.—1"x5"x34"—marked "back."
2 pc.—1"x7"x19"—marked "sides."
1 pc.—1"x7"x36"—marked "front."
1 pc.—1"x5"x34"—marked "bottom."
2 pc.—1"x7"x34"—marked "bottom."

The insertion of a couple of thumb tacks on the guides where the drawer makes frictional contact with them, will ease the motion.

After the drawer is assembled and the glue has thoroughly dried, test the drawer for proper fit. It will be found that the action of the drawer will be greatly helped if the bottom edges of the sides, which run on the drawer guides, are planed smooth, and then finished with sandpaper.

At this point in construction, the two leg braces are attached. The braces are half-lapped at the center. This means merely that a section of wood is cut from each of the pieces, so that they will fit together at the intersection.

The work bench is now finished.

The tool panel is made from 1" white pine stock, as was the drawer, and is the same size overall as the top of the bench. Take the 1"x3"x13' piece, and cut it into four lengths, two pieces of 4'—8" and two pieces of 22". The 1"x12"x9'—4" piece is cut in half, which makes the back of the panel. In assembly, glue should be used, screws preferred but nails will do the trick.

When thoroughly dry, scrape excess glue away, fill cracks with plastic wood, and for a good job, finish with sandpaper. The panel is now attached with three strong hinges to the bench top, and a strong hasp is secured to the panel.

In hanging tools in the box, care must be taken to insure against their falling when the box is closed. Two strong straps are used for this purpose. First hang the tools on the panel in the positions you wish to keep them. Then with a pencil, outline each tool, remove the tool, and fill in its outline with black paint. In this way one sees at a glance where each tool belongs. If desired, two straps may be nailed to the panel at one end, so that they will stretch across each tool. Individual tool holders, of wood or metal, may be substituted for these straps. A number of small holes are punched in the loose end of the straps. A buckle, nail, screw or hook is now attached to the panel at the other end, so that the loose end of each strap can be fastened, after the straps are pulled tightly over the hanging tools. In this way the tools may be held when the box is let down.

The bench may be finished in any way the builder desires. Paint, stain, or natural finish may be used, depending solely on the amount of care used, or the appearance wished for in the product.

If dampness prevails at the position where the tool box is to be located, oil each tool well before putting it away.

City Under One Roof

(Continued from page 326)

city streets outside. Communication is also maintained with the company vault, three floors below the street level, where another group of guards is on duty.

The fire department is no extra drain on the "municipal" budget, for the police act as firemen in case of emergency. Few cities boast of more adequate fire equipment. One hundred and five standpipe outlets with suitable hose lengths are so located in the building and on the terrace roofs that every portion is protected.

The "street cleaning department," working with rotating brush machines, cleans several miles of corridors nightly. Meanwhile, another crew goes through the offices, cleaning floors, desks, and walls.

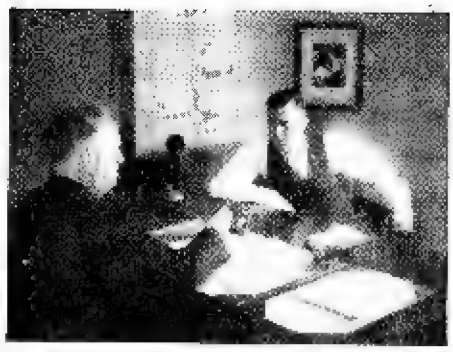
On the fourteenth floor is a hospital, headquarters of the health department. Here employees of the company receive thorough physical examinations yearly, and such clinical treatment as they may require.

Two other departments remain, prosaic but important adjuncts of the city service. The department of gas, electricity and water supply, as its name implies, is responsible for gas, electricity and water. Almost 20,000 kilowatts—more current than is consumed in many small cities—is needed for the automatic operation of coal-fired boilers, for the time clocks, mechanical counting machines, elevators, laboratory equipment, fans, air compressors, refrigerators, pneumatic tube system, and machine shops as well as for lighting.

The water requirements of the building also reach a surprising total. About 187,500 gallons per day are used for kitchen, toilet and drinking purposes.

Rounding out the services of this "city" is a bureau of maintenance and supply located on one of the basement floors and operating there the various carpenter, paint and machine shops.

Communication to and from the city, and within it, is speeded up by a private telephone exchange, through which are handled thousands of calls each day, by a mail and letter division—or post office—handling approximately 50,000 pieces of mail daily, by a pneumatic tube system.



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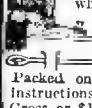

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MONEY

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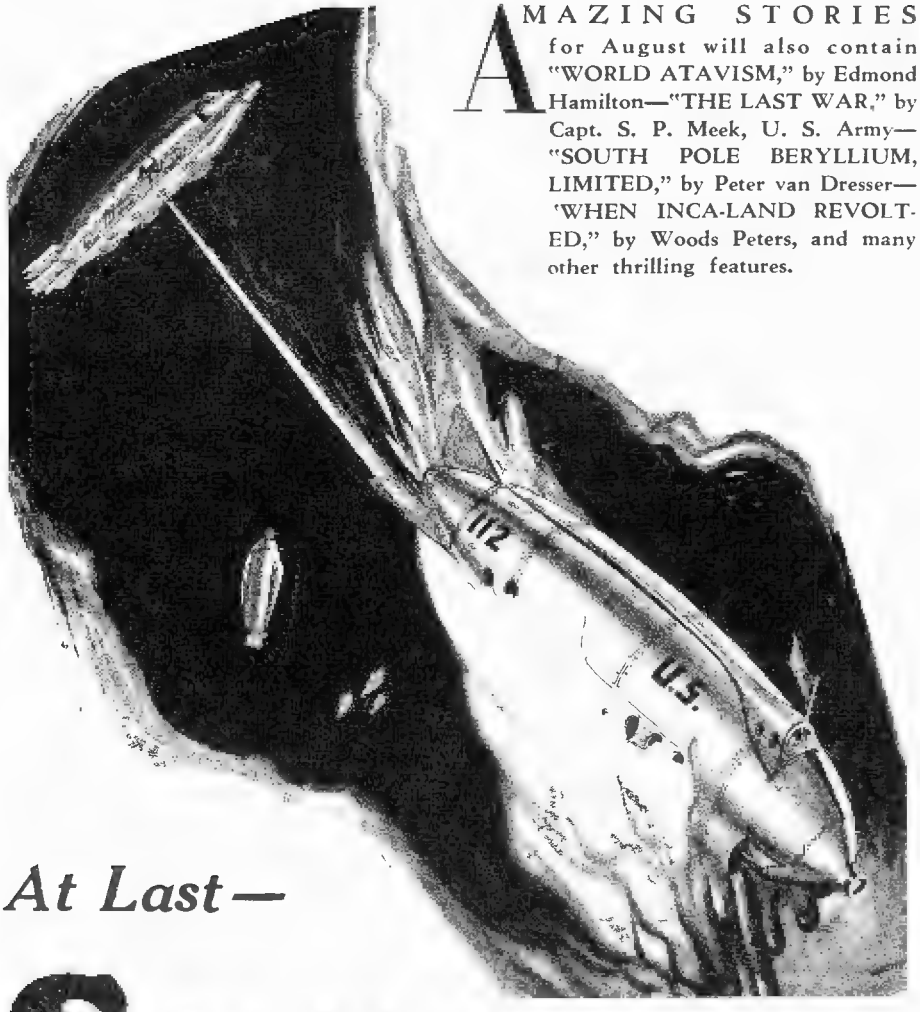

AMAZING STORIES for August will also contain "WORLD ATAVISM," by Edmond Hamilton—"THE LAST WAR," by Capt. S. P. Meek, U. S. Army—"SOUTH POLE BERYLLIUM, LIMITED," by Peter van Dresser—"WHEN INCA-LAND REVOLTED," by Woods Peters, and many other thrilling features.

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Wealth Without Work

(*Continued from page 327*)

attest that his unique venture has paid dividends in health as well as in cash. Attired in a one-piece overall suit and a mechanic's cap, he apologizes to visitors for his appearance.

"A farmer neighbor shaves me every Sunday when he's here," Wert explained. Just now he's in jail for bootlegging, so I missed my shave last Sunday."

The refinery consumes the production of seventeen oil wells in a shallow pool east of Lawton. While the performance of the field is modest in comparison with its sensational gushing neighbors in other sections of Oklahoma, Wert says production has not decreased despite the fact that the pool has been giving oil for 20 years. The average daily output of the refinery is about 250 gallons of gasoline, a like amount of kerosene, some ten barrels of fuel oil and around 150 gallons of lubricating oil.

The refinery won its malodorous name from a town wit who visited it on a day when a run of crude oil with a high sulphur content and an offensive aroma was being put through the stills.

Schempp Cabane Spindle

(*Continued from page 327*)

the eight turnbuckles. You can even leave them safety-wired. Moreover, you won't have to adjust every turnbuckle and bracing wire. Yet you will be sure that the wings are properly in line.

Equip your glider with the cabane spindle of which I am giving you here construction details and sketches.

A slot 1⅜" wide and 7½" long is sawed in the main upright of the cabane. Fittings Nos. 1, 2 and 3 are made of sheet steel 1/16" thick, as shown in the drawings. The two fittings No. 2 are now bolted to the cabane, as shown in the sketch, with ¼" bolts. Fitting No. 3 is just set into the slot and with its ends bent down will stay securely in place. A strong, square-headed spindle 8" long, with a ½" thread (No. 4), is purchased. Fitting No. 5 is made of ⅛" steel and has a large nut (thread like spindle) welded to its center. Be careful not to spoil the thread in welding. Copper bushings are hammered into the four holes of this fitting, which will receive the landing wires.

Spindle No. 4 and fitting No. 5 are set in the slot and held by fitting No. 1, which is bolted to the top of the cabane. Fork turnbuckles must be used to connect the bracing wires with the wing fittings. After the wings are set in the correct position (so that they form a slight angle) with the bracing wires under the right tension, secure the turnbuckles with strong copper wire.

To disassemble the glider and take off the wings, turn the spindle with a crank (an old automobile crank or furnace shaker made to fit the square spindle head will do). The nut will travel down and thereby loosen the bracing wires. It is now simple to pull the pins in the turnbuckle forks to disconnect the wires without taking off the safety-wires from the turnbuckle barrels. To assemble the ship replace the pins and secure them with cotterpins. Crank the spindle. The nut raises and stretches the bracing wires. As soon as the wings are in position, the crank is removed and the glider is ready to take the air. Do not tighten the bracing wires until they sound like violin strings. It only causes unnecessary strain in the material.

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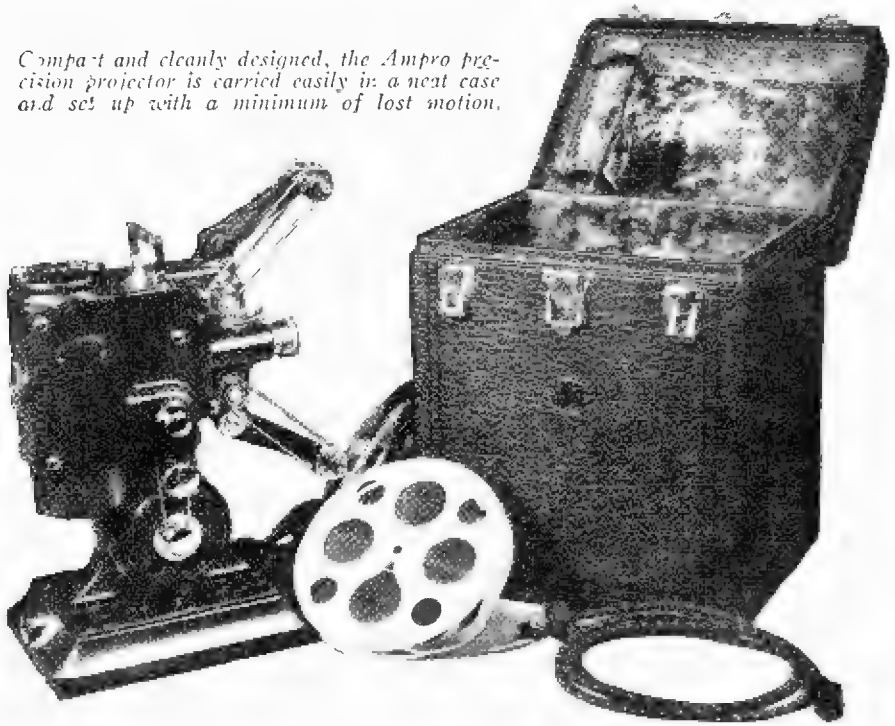
New Precision Projector Is Well Engineered

Compact and cleanly designed, the Ampro precision projector is carried easily in a neat case and set up with a minimum of lost motion.



THE new precision projector for the amateur placed on the market by the Ampro Corporation of Chicago has the clean lines and efficient arrangement of controls which one might expect in a machine freshly conceived and designed as a unit to serve a specific purpose.

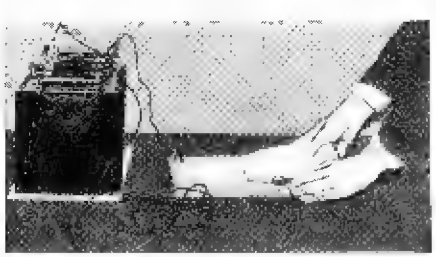
Even distribution of light is obtained in the Ampro by a drum-type shutter, which opens a rectangular slot, instead of a triangular segment, to the projecting light beams Major operating controls are concentrated on the right-hand side of the machine. Rewind button and still-picture shutter control only are on the left. The framing control is on top.

Forward and reverse action, variable speed, rapid automatic rewind, and brilliant still projection are operating features of the Ampro. Four hundred feet of film are rewound in less than a minute, the makers claim. A 9.5 to 1 movement plus a special system of film tension, it is said, make projection flickerless and steady to an extraordinary degree. The threading operation is easily performed, declare the manufacturers, even by inexperienced operators.

A "Superlite" model of the Ampro, for lodge, school, sales and industrial projection, is also available. In this model the range is much increased.

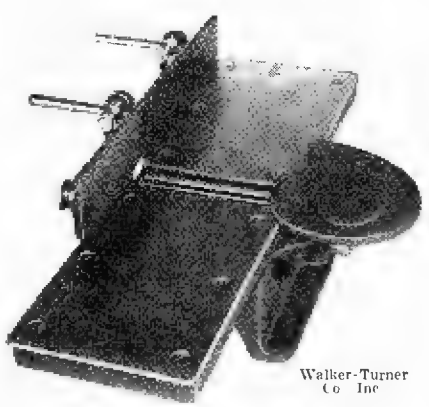
Nickel-Plating with a Pad

HERE is a device with which you can nickel-plate metal parts of your car without removing them from their fastenings. The parts to be plated are first thoroughly cleaned with a cleaning paste. All rust spots are rubbed off with fine emery paper. The storage battery is then grounded on the negative side. This is already so grounded in some cars but in others, the connections must be reversed. The positive lead, having been removed, is connected to the moistened pad containing the plating salts. This pad is rubbed back and forth across the area to be plated. The new nickel coating is polished with any metal polish to obtain the bright luster. Any brass or copper object can be plated if one has access to a storage battery.



Nickel Plate Co. of America

A nickel pad being used to deposit a plating on a sheet of brass. Note connections to storage battery.



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Now—Take the Floor

(*Continued from page* 314)

of practically all parts of the house, excepting the bathroom. It has been a quite common practice in the past to employ good hardwood for the downstairs floors, and soft woods for the bedrooms. Except where the severest economy is essential wood floors are now almost always of the hardwoods.

Among these, oak is probably the most popular because of its wear-resisting qualities and its adaptability to almost any kind of finish. There are several grades of oak flooring, running from the selected, quarter-sawed type to the cheapest plain-sawed varieties. The quarter-sawed oak represents one of the finest floors obtainable because the method of cutting brings out the beauty of the grain, the surface is more durable and the boards are less likely to shrink and swell. In other woods, too, the quarter-sawed is to be preferred.

Maple is another hardwood which is very popular. Many claim it to be superior to oak for upstairs rooms because its close grained hardness is not so likely to be marred by the movement of beds or heavy furniture. Its grain is not as attractive as that of oak and it is no longer the practice to finish it in its natural color. It is usually stained to make up in tint what it lacks in beauty of grain. Maple takes a high polish and is easy to keep clean because of its unusual surface smoothness. It is considerably less expensive than quarter-sawed oak, and little more expensive than softwoods.

Courtesy Armstrong Cork Company

This linoleum covering could easily be mistaken for black marble tile, and provides an excellent background for rugs

Courtesy Goodyear Tire & Rubber Company

A dining-room floor of rubber tile is attractive, easy to keep clean, and stainproof

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In RADIO NEWS *for August*

Fred H. Schnell, one of the world's foremost amateur operators, in an illuminating article on a short-wave superheterodyne for the home constructor.

A story on the advantages and the technique of recorded radio programs.

The detector is the nucleus of the radio receiver. This portion of the receiver is fully covered by James Martin, under the title "Shall We Use Grid or Plate Circuit Detectors?"

A concise outline of the synchronizing of a television receiver by D. E. Replogle.

The theory of the new Hopkins Band Rejector System and how it is applied to a superheterodyne.

A story in pictures of present day audio amplifiers for home, school, theatre, hospital, outdoor work, etc., as well as a detailed chart with the operating characteristics of thirty-two amplifiers.

"Loftin-White Public Address System," by Geo. E. Fleming.

"Interpreting Receiver Performance by Laboratory Measurement," by Alfred H. Grebe.

Two articles on the Technique Sound Recording Employing the Film and Disc Methods, by Goudy-Powers, and Fred A. Jewell.

How to Build a Fly Weight Transmitter, a companion unit to the Radio News Glider Receiver.

"Sustaining Programs"—How NBC is using the sustaining program as an experimental laboratory to perfect future broadcasting.

Of course, the attractiveness of any floor depends largely on the method of finishing and it is generally agreed that nothing but the finest finishing materials should be used. New floors should be made smooth by planing and sandpapering after laying. No matter how smooth the surfaces of the individual boards, a laid floor is never entirely smooth. Sanding machines used for this purpose save time and labor.

Courtesy E. L. Bruce Company

This oak block floor has been chemically treated to prevent swelling, shrinkage or warping.

The actual finish employed depends upon the wood used and the owner's preference. The trend seems to be toward retaining the natural color of the wood, and giving it a hard, smooth finish of either wax or varnish which can be renewed from time to time, and which is easily cleaned.

Before leaving the discussion of wood for new floors mention should be made of the vogue for wide plank flooring. Oak planks up to sixteen inches in width are used, often quite widely spaced and the spaces filled with a dark composition to define the planks. In rooms with beamed ceilings and a general appearance of ruggedness this type of floor is particularly fitting, especially with dark colored plugs set into the planks to simulate wood pegs.

The difficulty found with this type of flooring has been the tendency of the wide planks to shrink and swell, resulting in buckling, or in gaping joints. A new process of chemical treatment during manufacture has produced a wide plank flooring which largely eliminates this by making the blocks damp-proof and rot-proof. The same process is applied to a new type of wood strip flooring, assembled into blocks from 6¾" to 11¼" square, with the processed strips bound together by a steel spline at the back. The blocks can be laid in a variety of patterns with speed and economy, and are available in oak, maple, beech, mahogany and three or four other woods. Perfect assembly without nailing is obtained by cementing these blocks to the sub-floor with a plastic cement that does not set. In addition, each block is grooved on all edges and during the laying of the floor the blocks are held firmly together by strips driven into facing grooves.

While wood is beyond doubt the most widely used flooring material, there is a constantly growing demand for the newer types of resilient flooring, including linoleum, rubber tile and other compositions. The home-owner or home-builder will do well to make a study of these because they offer certain advantages for use either in place of wood for new floors, or as a new flooring to be laid over old floors. These flooring materials easy to keep

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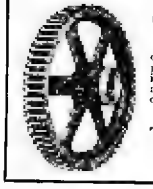

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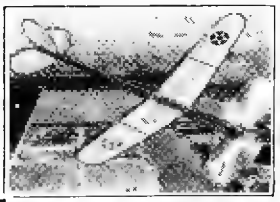

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clean, and comfortable under foot, sound-deadening and not affected by changes in humidity. They are also extremely durable. But their outstanding feature is the colors and designs in which they are available. For entrance halls, sun porches, kitchens and breakfast rooms particularly, the resilient floorings are obviously practical and appropriate. In the nursery, for instance, and in the living-room or dining-room, they can either be left uncovered or can serve as a background for rugs.

Much of the success of a linoleum, rubber tile, or other similar flooring lies in the selection of the material and the care with which it is laid. For a permanent covering on an old wood floor or a wood sub-floor, resilient flooring should be laid over felt lining with the felt pasted or cemented to the wood and the new flooring cemented to the felt. The felt acts as an added insulator and sound deadener, and as a flexible bond between the flooring material and the wood, permitting the wood to shrink or expand without affecting the surface material.

It is usually considered best practice to employ a waterproof cement with resilient tile floorings; and with sheet or strip floorings to employ waterproof cement at the edges and joints to prevent water getting down under the flooring. It is, of course, imperative that floors over which either the tile or sheet material is to be laid be first made smooth and even, because any physical irregularities in the under flooring will appear in the finished floor as well.

Generally speaking the proper laying of these types of flooring is not a job for the amateur. For best appearance and permanency, a considerable amount of skill is required. This adds to the expense of the floors, of course, but not excessively. Proper laying involves the use of a heavy roller to insure absolute smoothness and a firm bond. When correctly laid, one of these floors will appear so perfect that it will be difficult to find the joints between sheets, or to detect the joints between tiles. Usually the dealer who sells these materials also lays them. In fact they are usually sold at a price which includes laying.

For owners of homes in which there are wood floors that have seen better days, a real hope is held out by the floor sanding machines now so widely used in floor finishing work. In almost every neighborhood there is a carpenter or contractor equipped with one of these machines, who for a reasonable price will go over wood floors and put them in excellent shape for refinishing. If the old floors have been deeply stained, it may be necessary to resort to bleaching with a solution of oxalic acid spread on the floor and allowed to stand over night, then carefully sponged off with a damp cloth. In addition, such treatment will smooth the whole floor for refinishing.

The overall carpet is another solution of the problem of what to do with worn out floors. Some surprisingly rich effects can be obtained with inexpensive carpets laid over a good lining. There is one lining, for instance, which is cellular in construction and made of hair felt. This provides a combination felt and air cushion under the carpet which gives it the feel of a long pile carpet of much higher cost.

Awards in Basement Plan Contest

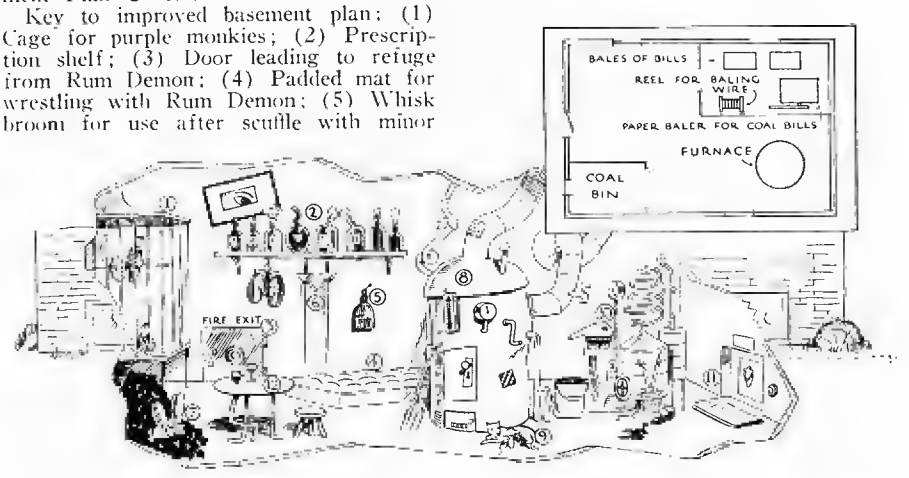
Announcement of the winning plans in the Basement Improvement Contest will be made in the September number of SCIENCE AND INVENTION. . . . Especially satisfying has been the high interest evinced by our readers in home improvement, not only with respect to the basement, but to every part of the home. . . . In this connection we shall be glad to take care of further requests for the helpful Home Service booklets listed in SCIENCE AND INVENTION for April, May and June.

Many manufacturers have prepared illustrated booklets that will help in your home improvement plans. These were listed in our manufacturers' directory for April, May, and June, and may be had free upon request. Please use box under list and order by number.

Special Basement Plan Award!

AT the right is the plan of a basement belonging to a certain party. Below is the same basement after the party had improved it, without, however, improving himself. Because of the ingenuity of the plan we have decided to award the originator a special prize consisting of an asbestos-lined cocktail grinder in the Basement Plan Contest.

Key to improved basement plan: (1) Cage for purple monkies; (2) Prescription shelf; (3) Door leading to refuge from Rum Demon; (4) Padded mat for wrestling with Rum Demon; (5) Whisk broom for use after scuffle with minor concoction; (6) Foils for inquisitive prohibitionists; (7) Coal bin for escape during investigations by unsympathetic parties; (8) Furnace with accessories; (9) Watchdog, disguised; (10) Still, connected with bypass from furnace; (11) Exit to garage where truck stands with engine running; (12) Testing table.



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In Amazing Stories for August

"Skylark Three," by Edward E. Smith, Ph.D. (A Serial in three parts.) Part I. Just about two years ago—specifically two years ago in the August issue—we began that much lauded story, "The Skylark of Space." Since that story was completed there were innumerable requests for a sequel. Beginning with the next issue—August—we begin the sequel in a serial in three parts. "Skylark Three" is more magnificent, swifter and more thrilling than the other. We suggest that you order your magazines now to make sure you get them.

"World Atavism," by Edmond Hamilton. We know that the sun's rays play an all-important part in life processes, and in the present story it is taken that they are constantly improving and evolving a higher race of man. In this short story, Mr. Hamilton uses, for him, an unusual theme, which he weaves dexterously into a tale of considerable importance.

"The Last War," by Capt. S. P. Meek, U. S. A. Who should be more authorized to write a story on the wars of the future than an army man? Capt. Meek is an army man. He has evolved a most ingenious treatise on what man may do in the future to conquer nations. It seems almost prophetic.

"When Inca-Land Revolted," by Woods Peters. Almost all great discoveries have been due to accidental findings, often during experiments made in domains of science seemingly far removed from the field of discovery. It can hardly be considered beyond the realm of possibility, therefore, that some enterprising and imaginative young scientist might accidentally discover a means for transmitting personality. It would prove a minor matter to devise a means for accompanying such transmission with the voice. In this fascinating story of future achievement in science, our new author tells, in an absorbing manner, of startling events in a hidden land.

"South Pole Beryllium, Limited," by Peter van Dresser. Beryllium is a metallic base of the emerald and it is a metal which bids fair to enter into industry, in a sense, the last development in metallurgy, or about to be such. Admiral Byrd, establishing himself at the South Pole, mapped those almost unknown regions, so that the Antarctic is now familiar to us. This story is particularly opportune at this time. Both subjects are fresh topics in the world of science.

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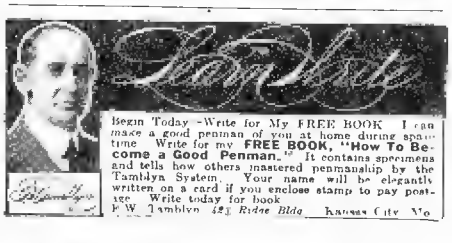
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"The Padre of the Rains"

(*Continued from page* 306)

positions, accurately determined by the mathematics of astronomy, is necessary. We know that a sunspot rising today will transit in 6.82 days, and that the synodic rotation of the sun takes place in 27.28 days. By putting all these together we can determine the occurence of sunspots and the time of their transit.

"The fact that the moon exerts a decided influence in making air tides and is an infallible guide in localizing weather conditions, is also important. Northern sunspots astride the central meridian synchronize with the arrival of storms on the Pacific coast; southern sunspots astride the central meridian synchronize with the arrival of counter-storms on the Pacific coast.

"The output of solar heat," Father Ricard continued, "varies through the influence of sunspots. The highs and lows in the earth's atmosphere are traced to the same cause."

Regardless of whether they understand Father Ricard's theories or not, many Californians are today deeply concerned over the illness of their favorite weather prophet. At the same time much satisfaction is expressed that the monthly bulletins will continue from his observatory, issued by the observers whom he has trained to carry on his work.

The new Ricard Memorial Observatory has been completed and dedicated within the lifetime of the great scholar. It is erected upon the grounds of the campus of Santa Clara University, alongside the old buildings of the original Spanish Mission from which the city took its name. The cost of buildings and equipment is estimated at a half-million, and represents the contributions of graduates of the University, friends and members of the Knights of Columbus. The observatory is in charge of Father James B. Henry, S. J., a noted astronomical scientist. He and his assistants, like Father Ricard, will perform the necessary work, in addition to their teaching duties. Father Henry hopes eventually to be able to forecast weather not only one month, but seasons ahead.

Plug It In!

(*Continued from page* 313)

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C3—Aerovox condenser, .00025 mfd.
C4—Hammarlund equalizer, 35 mmfd.
C5—Aerovox condenser, .00025 mfd.
C6, C8, C9—Aerovox by-pass condenser, ½ mfd.
C7—Aerovox condenser, .01 mfd.
R1—Aerovox grid leak, 4 megs.
R2—Electrad Royalty variable resistance, 0-500,000 ohms.
R3—Lynch Fixed Resistance, 1000 ohms.
L1, L2, L3—Set of four coils as described in Fig. 2.
R.F.C.—National choke, 90 henries.
L4—Coupling coil, pri. and sec. 3 turns each on ¾-inch core, coils separated ¼ inch, side by side.
Two National vernier dials, type E.
One National connector plug, 4 contact.
One Yaxley filament switch, No. 10.
Three Eby binding posts.
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Scientific Book Reviews

MOTHER WIT, by Estelle H. Ries. Published by The Century Co., New York; XI; 301 pages. Price $2.50.

This book is a study of man's ingenuity through the ages. It explains how necessity spurred him on in his search for security, convenience and comfort. It follows through chronologically the story of how we came to count time, how our ancestors attempted to conquer fire, how dining customs, clothing, furniture, money, travel, marriage, developed.

Miss Ries has written the book in a very interesting manner, combining the amusing with the amazing. . . . She does not attempt to give us a scholarly treatise, but an entertaining, romantic story of how all our commonplaces today came into being. From the anecdotes given (and there are many) it is evident that she has traveled widely and absorbed much unusual information.

If you want to know the why and wherefore of the wedding ring, of the post office, of the caveman and his cave, or the modern skyscraper, if you are curious about how your ancestors lived, about what they wore and what they did, we recommend this book. It makes good reference reading for the high school or college student of general science and economics.

Unfortunately, we cannot agree with Miss Ries in her optimistic view of progress and what it constitutes, and her interpretations of history and historic developments are often open to question.

STUFF, by Pauline G. Beery. Published by D. Appleton & Co., New York; XIII; 504 pages. Price $5.00.

"Wars have been fought to gain possession of regions where certain important stuffs can be secured. Much of man's history is thus the story of his search for the stuff which will be of service to him." So Miss Beery prefaces her book, a scientific survey of chemistry and how it has aided mankind. The wonders of discovery that have come from the test tube to make our daily tasks simpler, to create new styles for us, to revolutionize our mode of living are treated. The book is essentially a history of the stuffs, coins or cables, planes or skyscrapers, artificial ice or formaldehyde gas, that our chemists have experimented with.

Particularly interesting are the chapters on "A Breath of Fresh Water," "Cold Stuff," "Measuring the Ups and Downs of the Weather," "Medical Stuff," and "The Chemist and the Cow." There are several illustrations which add to the clearness of the book.

While putting together so many historical facts interferes with the interest of the book (except for the student of chemistry) it is, on the whole, a straightforward, intelligible, and up-to-the-minute discussion of chemistry and its value.

SKYWAYS, by General William Mitchell. Published by J. B. Lippincott Company, Philadelphia and London; 314 pages. Price $3.00.

As former Commander of the Air Forces of the A. E. F. and Director of Military Aviation in the United States, Brigadier-General William Mitchell is the proper person to give us a story of modern aviation. And he has done the job very well.

Even if you know nothing of planes and their handling, if the propellor, the wings, the fuselage are mysteries to you, you will enjoy this book, and incidentally, the mysteries will be dissolved. Engines of various types, instruments, safety devices, maps, weather, all receive due attention in clear, non-technical language.

If your knowledge of aviation is quite extensive, you can still gain a good deal from Brigadier-General Mitchell's chapters on flying fields and airways, on aviation insurance and laws international and otherwise. Military aviation, the sporting side of aviation, and aviation of the future are all dealt with in a practical and convincing manner.

Of course, the author believes firmly in the supremacy of planes for national defense, for transportation of both freight and passengers . . . and after one has read his book, the reasons for his optimism seem fully justified.

This book should be read by everyone interested in the story of aviation.

SHORT TALKS ON SCIENCE, by Edwin E. Slosson. Published by the Century Co., New York; XII; 281 pages. Price $2.00.

Through "Creative Chemistry," "Chats on Science," and his "Snapshots of Science," Dr. Slosson became well-known to the scientific world and all those who desired to know just what was happening around them. For his short sketches, written in popular style, have instilled in the minds of many layman an appreciation of science and an understanding of its effect on their well being.

These "Short Talks on Science" represent the work of Dr. Slosson's last year before his death. They have been gathered together by Watson Davis, who worked with him on "Science Service," and many are reprints of his articles in "Collier's," and the "Science Service" notices. Ninety-seven different topics are treated in less than three hundred pages, so that the sketches are, of necessity, brief. In spite of this one can learn a good deal from them, and interest never lags.

Einstein and his theories, synthetic diamonds, cold air heat, self-seasoned poultry, vanishing matter, Muscle Shoals and birth control, a fresh-water source of vitamin D, a moth-hunting molecule . . . topics unusual and commonplace are treated. Illustrations are well chosen and add to one's enjoyment of the book. It is a pity that the volume, which is so sound scientifically, is not longer, both for the number of subjects and the space allotted each one.

Where Outboards Bound

(*Continued from page* 308)

by outboard motors, and the vessels are still manned by dusky skinned natives. Pearl divers and fishermen find the motors valuable assets in their business.

Several organizations have gone into the manufacture of tachometers which can be applied to outboard motorboats. The entire construction takes on the form of a flexible shaft, a coupling that can be connected directly to the flywheel of the motor, and a tachometer reading from zero to 8,000 r.p.m. A tachometer reveals at a glance imperfect engine performance caused by poor ignition, defects in compression, faulty ports, pistons or piston rings, imperfect balance, or in fact it tells immediately when your engine is going bad or when the adjustments you are making are improving the speed. The one here illustrated was made by the A. C. Spark Plug Company.

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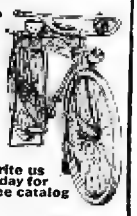

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2. Photos should be sharp and clear. Not smaller than 4 in. x 5 in. (Do not send films; glossy prints are best.)

3. A rough sketch of the plan of layout should be submitted, with a list of the equipment and tools.

4. Awards will be made on the basis of completeness, practicability, arrangement of equipment, material and tools, and compactness.

5. Each monthly contest will close on the 15th of the second month preceding date of publication.

6. The opinion of the judges will be final. In event of a tie, an award identical with prize tied for will be given each tying contestant.

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The size of the object is immaterial. An article as small as a match-box stands as good a chance of winning first prize as a construction as big as a house. All items will be judged from the following standpoints, the one considered best will be given first prize, next best will receive second prize, etc.:

1. General appeal.
2. Originality and uniqueness.
3. Practicability.
4. Ease of construction.

All entries must be accompanied by sketches from which we can make finished drawings.

Photographs, while not necessary, are highly desirable and will count in the judges' decision.

Address all entries to Handicraft Editor, Science and Invention. Entries must be in our hands on the 15th of the third month preceding date of publication.

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The prizes are as follows:

1st Prize—$25.00.
2nd Prize—$15.00.
3rd Prize—$10.00.
4th Prize—$5.00.

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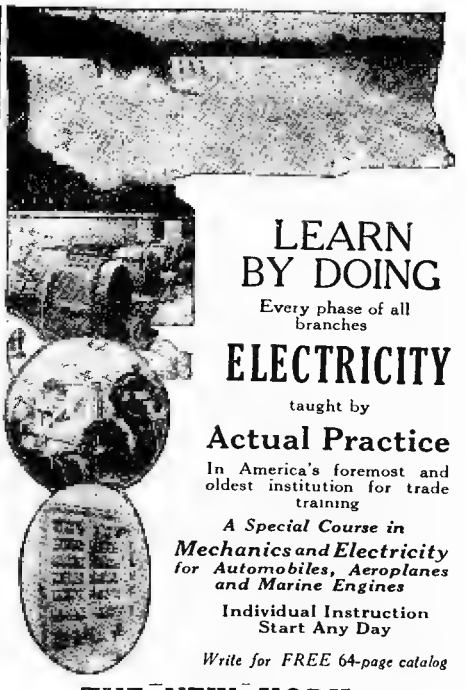
The winners in our every-month contests closing June 15 will be announced in the September SCIENCE AND INVENTION.



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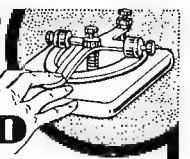

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The Sky Navy's Playful Porpoise

(*Continued from page* 301)

When we finally got into the air (and going up in this ship is the pleasantest sort of flying I have ever done) we cut across the Jersey pines and coasted out over the ocean where the air is like a soft cushion, always smoother than over land. We flew all that day and almost to sunrise the next day, and not once was there a bump comparable to those continuously experienced in airplanes, nor were there any of the undulating swoops with which the small non-rigid blimps commonly porpoise along their way.

Our job that day was to fly in great arcs about the coastal radio stations, keeping in constant communication with them so that they could calibrate their radio direction-finding instruments. This was necessary because radio waves are bent, as they circle outwards, by inequalities in the coast lines and other permanent irregularities. By flying in an arc on the ocean side of each station and letting that station and one or more others listen in, meanwhile noting variations from actual position on the direction finders due to bent radio waves, it was possible to correct the readings for future use. Then, when a ship at sea asked for position, two calibrated coast stations could triangulate with their tested direction finders, compare notes, and give an exact position.

Although we cruised at reduced speed during the day's operations, we arrived at Hampton Roads shortly after dark with the work completed. We were scheduled to tie up to the mast-ship Patoka for the night and we picked her up with signal lights and nosed forward through the blackness for the delicate operation of mooring.

But we were not to call on the Patoka after all that night. For suddenly the blinking shafts of light leading us onward to the Patoka were dimmed by the brilliant flashes of a sudden electric storm, a storm bearing none too happy a resemblance to the one in which the Shenandoah had foundered, and to another which on a previous occasion had torn the Shenandoah from its Lakehurst mast and sent it whirling into the night with a skeleton crew aboard.

The Los Angeles Retreats

As the storm approached over Richmond sharp orders were barked in the Los Angeles, and the crew, several of whom had not been in the air since they were saved from the disintegrating Shenandoah, went into action.

The ship was turned around. The order from the control cabin was "Full speed ahead." And on the horns of the storm we raced for Lakehurst with our five giant engines revving up to high speed.

At first I thought we were in for some excitement, some tossing about such as one gets in a plane in stormy weather, but the big ship plowed through the night as steadily as a tug in the North River. We moored to the home mast just before dawn, and riding down to the ground in the tiny elevator I was filled with admiration for the airship. But I was inclined to believe that it was so perfect a thing that all romance and thrill and uncertainty were improved out of it.

But I found I was wrong in that when I went to Lakehurst on a winter's night to see the ship return from a flight to Panama, the longest journey it had made since it was first brought to America across the Atlantic from Germany to satisfy a portion of the war debt.

Shortly after midnight the Los Angeles arrived over the field from her placid trip South and back, and almost immediately we were made aware that the old lady was in one of her moods. As a starter she sprayed a load of water ballast all over the small crowd waiting to greet her, and that is far from the last word in comfort on a freezing night. (The first time the German Graf Zeppelin came over I saw her dump water all over Rear-Admiral William A. Moffatt of our navy, but that was on a warm day.)

Next the Los Angeles balked at being secured to the big mast. Finally the steel cable from the mast was connected to the ship's nose, but she gave a yank and the parted cable fell hissing among the ground crew. Fortunately no one was hurt.

An Unscheduled Flight

It was decided then to bring the ship down to the ground in a hollow almost a mile away on the other side of the hangar. It was flown to the spot, and when the spider ropes were dropped it permitted itself to be drawn to earth with a docility which seemed, but only seemed, to indicate that there was to be no more fractiousness.

When the ship was down some of the ground crew stayed on the ropes and others grasped the rails that run along each side of the cabin. Sailors began loading aboard cans of fuel, awaiting a favorable moment to walk the hulking bag into the hangar.

I had been in the hangar telephoning my story and was walking back to the ship. I was about a hundred yards off when a sudden gust laden with dense snow struck me from behind and I went to my knees in the sand. In that position I saw the wind smash against the broadside of the Los Angeles and tear her from the ground.

It was like some freakish nightmare. The great ship, which I knew could act so sweetly when it wanted, lurched into the air like a diver leaping from a spring board. The members of the ground crew holding the spider ropes fortunately let go when they realized what was happening, but five men on the rails outside the cabin were so taken by surprise that they tightened their grip.

And the Los Angeles soared into the air with five men hanging on for their lives and ten legs swinging helpless in the wind. One man dropped at twenty feet and was taken to the field hospital with a slightly injured ankle. The others held on and disappeared into the snow as the airship's engines roared into life and the dirigible was headed into the night.

There was speculation among the witnesses as to the chances of the hanging members of the ground crew; whether they could retain their hold in the chill of the storm, whether the men on the board would realize their plight, and whether they could help them if they did.

But in the operations office cool efficiency was bringing quick order out of the momentary chaos. By radio the Los Angeles was informed of the men underneath and a few minutes later a wireless reply came in from the ship, saying in effect: "All well; everybody inside."

It was not until later, until the storm had passed and the ship had been brought quietly down and walked uneventfully into the hangar, that we learned how the rescue had been effected. The hand rails run along the lower edge of the cabin, about two feet below the windows. Men inside the ship had opened windows, leaned far out and down, and hauled the aerial prisoners to safety by the scruffs of their necks.

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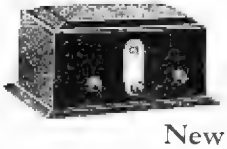

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What About Television Stocks?

By Alfred M. Caddell, *Financial Editor*

FOR some time past the writer has been receiving inquiries regarding the possibilities of investment in television stocks. In practically all of these letters there breathed the desire of the writers to "get in on the ground floor" of this amazing new industry with its still more amazing possibilities. But, for the sake of their pocketbooks and mental good health I had to be very careful to emphasize the familiar slogan: Watch your step. Investigate carefully before buying stocks.

Briefly, the time element that surrounds television is the hub of the whole matter. Anyone who knows anything about the achievements of science and appreciates especially the efforts being put forth to bring television into the home in conjunction with radio receivers, knows full well that success will crown such efforts. Television is already here in a practical, experimental way. There are at this moment eight radio broadcasting stations sending out regular television programs, so that folks with television receivers may have something to play with, and by playing can build up enthusiasm for the youthful art. The age of experimentation has been ushered in and hundreds and possibly thousands of experimenter lookers-in are lending thought toward the overcoming of present difficulties. In a sense, the present status of television is akin to the status of radio that prevailed in the early broadcasting days when everyone from Johnny to his uncle experimented around with crystals, batteries, loud squeakers and such-like and enjoyed the "noise" that his badly designed receiver gave forth.

Since those days radio has made some enormous strides, and the chances are that television shall do likewise. "In the field of sight transmission by radio there is no longer any mystery," says David Sarnoff, President of the Radio Corporation of America. "I have no hesitancy in saying that television will eventually arrive in the home. I am confident that in less than five years you will be able to receive images through space as well as you are able to receive sound through space at the present time. The difficulty is not with the transmitting apparatus or the receiving apparatus. It lies in space itself. Nature has not yet given up all of the secrets of space."

Recently, the General Electric Company gave a public demonstration of television reception on a screen similiar to that used for motion picture reproduction. The images were large and clear compared to those previously received. It was indeed a long step toward the ultimate.

The Bell Telephone Company has made some remarkable contributions toward the new science, as have also John L. Baird, a Scotch scientist; C. Francis Jenkins of Washington, D. C.; the Westinghouse Electric and Manufacturing Company at Pittsburgh; Philo T. Farnsworth, a research worker of San Francisco, who it is reported has developed a cone-shaped vacuum tube device that dispenses entirely with the revolving disk, the image being seen on a fluorescent screen. In Boston, the Short Wave and Television Laboratories are working on color television. Numerous other companies and individual research workers are likewise busy, either adding their mite of improvement to existing apparatus or carving new pathways in the unknown.

"I venture to predict," says Dr. Alexanderson of the General Electric Company, "that we shall soon see a wave of activity in amateur television. There are more than 100,000 experimenters in America, young and old, who go in for radio from the standpoint of experimentation. These amateurs have been rather starved of real interest in the last few years due to the commercialization of broadcasting. They will be the ones who will popularize long-distance television, just as they were the ones who created the interest in broadcasting."

Already there are numerous companies engaged in the manufacture of apparatus that goes into the making of home-made television receivers. A large number of such companies are already making substantial progress and undoubtedly much more progress may be expected. Whether the television parts business will gravitate into the complete receiving set business, following along the lines of radio, remains to be seen. The main points in this little discussion are:

(1) As a business, television is here. It should develop into a gigantic business. The companies with the largest financial resources undoubtedly will get the cream of this business, due largely to the fact that they can maintain adequate research laboratories Of course, there are exceptions to this rule, but not many.

(2) It is going to take a lot of money to successfully put over any company, and any company that runs up against shortage of funds might find itself in the hands of a receiver.

(3) Due to the really stupendous possibilities awaiting television and the large number of half-truths as well as whole truths surrounding the art, scheming promoters have a fertile field for unloading worthless stock on a credulous public. Stop, look and listen to your own good sense, rather than to stock salesmen, before "investing" in some word-embellished proposition. Unless a company has unusual merit it is bound to have a hard time to survive in the face of adequately financed competition. If you invest in television it mght be well to put at least part of your funds into companies already established and who are engaged in other dividend-paying branches of business. That greatly minimizes the risk, and assures at least an even break in the pursuit of success.

Questions and Answers

Conducted by Alfred M. Caddell

Information on securities will be furnished readers of "SCIENCE AND INVENTION" free of charge by mail and through these columns. A 2-cent stamped, self-addressed envelope should be included in your letter. Address your inquiries to the Financial Editor, SCIENCE AND INVENTION, 381 Fourth Ave., New York City.

Question—Do you consider Warner Bros. common a good speculative buy? P. R., New London, Conn.

Answer Yes, the company is one of the major ones in the field of the "talkies" and its earnings are highly satisfactory. Paying 4% with extras, any stock bought below 80 may be construed to be a good speculative investment.

Question— I notice Worthington Pump has had a sensational rise from 67 to 162. Can you tell me anything about this company? S. P. B., New York City.

Answer Not anything that can be definitely relied upon—I am not "in the know" of such movements. Off hand, I would consider any purchase of this stock at high levels a very risky piece of business. The time to get interested in a stock is when the price is low—not at the top or so far away from the bottom. Of course, there are exceptions to this rule, but not many. Recently this company declared in addition to the regular quarterly dividends on the "B" and "A" preferred stocks quarterly payments of $1.50 and $1.75 respectively, to apply against accumulations.

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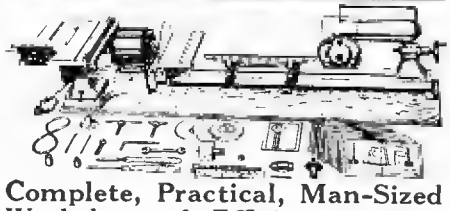

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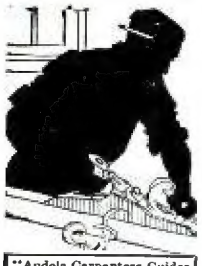

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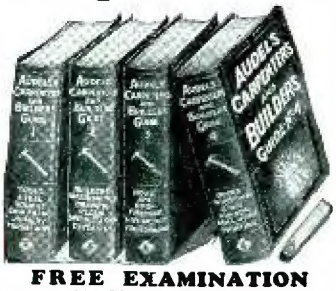

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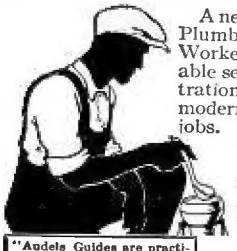

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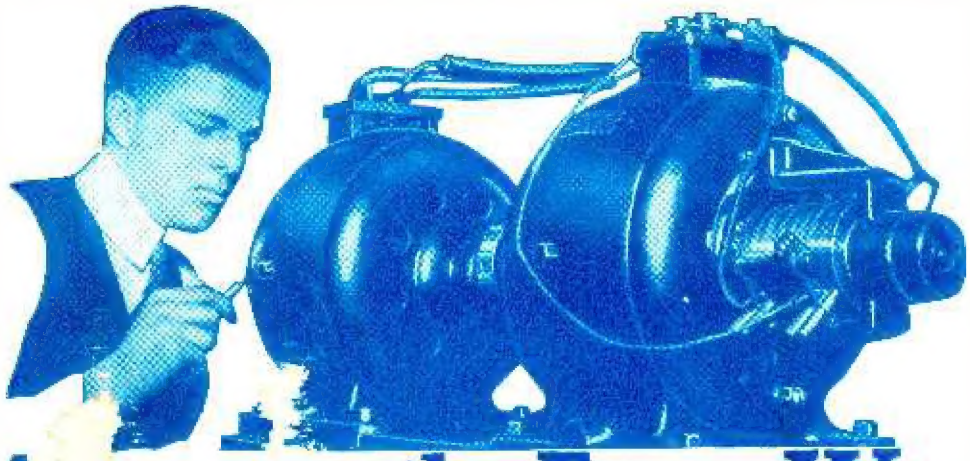

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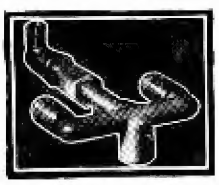

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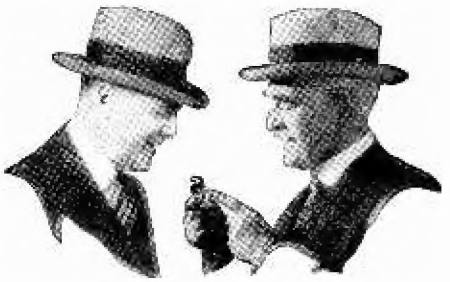

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